The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXIV. January 11, 1936 No. 863

AN index to Volume XXXIII of THE CHEMICAL AGE (July to December, 1935) is published with this issue. It will be found inside the back cover, whence it can readily be detached for binding purposes.

Industrial Waste Liquors

WATER is the largest single raw material used by industry, but because it is not, in general, made into a marketable product, it is also the largest single effluent. Furthermore, because treatment of effluents involves expense with no return, trade effluent water is frequently highly contaminated. It is often not realised that a beet sugar factory of average size discharges approximately 3,000,000 to 4,000,000 gal. of effluent a day and that these wastes, if discharged untreated into a stream, would have the same polluting effect as the domestic service from a town with a population of several hundred thousand people; the waste water from all the beet factories of the kingdom is equivalent in pollution power to the effluent from the whole of London. Even from dairies and milk product factories there is produced a quantity of sewage equal to that of a town of 400,000 people, and if the whey be discharged into a stream the effect may be disastrous since it is at least 100 times as powerful as an equal volume of domestic sewage. Many industries contribute deleterious effluents and there is an enormous amount of work to be done before practicable methods of dealing in an entirely satisfactory manner with the waste waters from all the various trade and manufacturing processes in operation to-day will be discovered. Even then, there will be fresh fields for the effluent chemist to conquer as new industries arise.

Serious deterioration of the condition of the rivers in various parts of the country began with the development of modern industry during the last century and the crowding of the population in the industrial areas. In the first half of that century practically all trade and large quantities of domestic sewage were discharged into the nearest streams without any form of preliminary treatment. Conditions became so bad that by the middle of the century the rivers and streams in the densely populated areas were little better than open foul-smelling sewers. Government action was necessary to rectify matters, and, with the still greater increase in industrial works to-day, constant vigilance is necessary. Apart from the damage to the amenities of life and to the sport and industry of fishing, it must be remembered that we take much drinking water from rivers, especially since available sources of water, surface and underground, are gradually being allocated to specific uses to fill the country's growing need for water.

The growing appreciation of the need for research on the application of practicable methods and the scientific development of new methods of avoiding or reducing the pollution of rivers and other water supplies by industrial effluents and sewages found its expression in the formation of the Water Pollution Research Board in 1927. One of the first conclusions reached by this Board was that reliable information was urgently required as to the effects on rivers of polluting discharges, and it was resolved to undertake a comprehensive scientific survey of a typical river flowing through an industrial area. There was a lack of exact knowledge regarding the conditions and the quantities of the various effluents which could be allowed to enter a river without causing serious pollution and unduly retarding the processes of self-purification. The survey of the river Tees has just been completed and a survey of the Mersey is in progress.

The survey of the Tees shows that into the stretch of seven miles from Stockton to Cargo Fleet numerous industrial efflents and much untreated sewage is discharged and large numbers of migratory fish passing through the estuary are killed each year. It would be impossible to follow this long and fascinating report in detail here; it is possible only to record the broad conclusion that the trouble is partly due to the effluent from iron pickling works which contains free HCl and much ferrous iron (15,000 lb. of iron per day), but primarily to the effluent from the comparatively few coke oven plants along the river bank. Coke oven effluent contains two polluting and poisonous bodies. The spent liquors discharged from the ammonia still contain 200 or 250 parts per 100,000 of phenols, but no cyanides. Here the phenols are the toxic bodies. The gases after extraction of ammonia in the direct or " hot " process are usually cooled directly by water which is taken from the river and returned directly into it. This water contains only some 10 parts of phenols, not enough to be toxic, but 4 to 10 parts of cyanides. The total weight of tar acids being discharged into the Tees is 2½ times greater than the weight of cyanides, but the toxicity of the cyanides is far the greater. It was found that trout can live for long periods in water containing a content of dissolved oxygen as low as 37 to 50 per cent. of saturation value, but that as the concentration of the dissolved oxygen decreased, toxicity of the cyanide and phenols greatly increased. It has been suggested that the volume of spent liquor could be reduced by reducing the amount of washing water; that the amount of toxic substances could be reduced by discontinuing direct cooling in favour of indirect cooling; and that the toxic substances could be further reduced by causing the cyanide to react with formaldehyde to form cyanhydrin (non-toxic) or with ferrous chloride to form ferrocyanide.

Notes and Comments

The Institute of Export

THE chemical industry has a direct and important interest in the foundation of the Institute of Export, whose inaugural reception at the Cordwainers' Hall, London, yesterday (Friday), was addressed by Sir Francis Goodenough and Sir Ernest Benn. Major T. Knowles, of Monsanto Chemicals, Ltd., has been appointed president, and besides the two speakers already mentioned the vice-presidents include Sir Harry McGowan, chairman of Imperial Chemical Industries, Ltd., Lord Hirst, Lord Meston and Sir John Prestige. The Institute is the first organisation solely devoted to British export trade and to the interests of those associated with it. It is designed to bring official recognition to export as a career, a career not only of national importance, but of great interest, with its prospects of foreign travel, and one which should attract the highest type of recruit. It will supervise the interests and improve the status of all those engaged in export, set suitable standards of export training and organise special export courses, hold conferences, arrange lectures and publish information of service to exporters, and it will seek to impress manufacturers with the vital importance of highly organised export to the well-being of their trades and of the country.

A Common Meeting Place

THE Institute of Export is described as the professional body to which the export executive should belong. It is the body from which he can obtain guidance and protection and to which he can submit problems; the body which will give him a newly-recognised status and provide him with many useful contacts. To the ambitious junior, it will provide the means of rising steadily in the profession according to merit. To merchants and manufacturers it is a body to which they can go for assistance on export problems, or in recruiting their export staff. To all members it will provide a common meeting place, where papers on export practice will be read and debates held on topical export subjects. Membership of the Institute falls under four main classes, particulars of which are contained in the Institute's booklet, which should be read by all those engaged or interested in export. It can be obtained from the Secretary at the Institute's headquarters, 21 Tothill Street, London, S.W.1.

Chemical and Dyestuffs Traders

FEW if any of the innumerable chemical organisations render more useful service to their members than the British Chemical and Dyestuffs Traders' Association, whose activities are so largely confidential that little opportunity is afforded for public reference. The opening of the new year has, however, provided the president, chairman and vice-chairman with a suitable occasion for reviewing a period of marked activity and advancement in 1935. Trade and industry have to contend with increasing regulations and considerable assistance has been rendered to merchants dealing in chemicals and allied products in overcoming the complications and difficulties that appear to be inseparable from Orders in Council and departmental restrictions. The operation of tariff legislation has become part of the everyday business life of traders throughout the United Kingdom and the experience of the last three years has shown how necessary it is to be well and promptly informed of alterations in import duties.

An Intelligence Service

THE Association has maintained what might well be described as an "intelligence service" on these matters and members have been advised promptly of any changes affecting their interests. This service is not confined to tariff matters only, as during the past twelve months up-to-date and reliable information has been furnished to members on such matters as the proposed regulations for the carriage of dangerous goods by road transport, a draft of which was circulated to each member; new standard specifications issued by the British Standards Institution; the regulations introduced in connection with international financial restrictions and the imposition of Sanctions. A cordial relationship has been maintained between the Association and the various Goverment Departments and the trade in general and individual firms in particular have, through the Association, succeeded in obtaining fair treatment. The services of the Association are in constant demand in connection with free imports, import duties, values for duty purposes, delays at docks and problems connected with customs. The new year will undoubtedly see a continuance of trade restrictions and complications and it is well that the trade has in existence a strong and well organised representative body that by its services saves its members a considerable amount of expense and time.

Nicotine in Cigarette Smoke

A MACHINE which will smoke cigarettes, cigars and pipes with puffs of constant volume and unvarying length at constant intervals has been employed in a recent investigation by Mr. C. O. Jensen, instructor in agricultural and biological chemistry, and Mr. D. E. Haley, professor of soil chemistry and phytochemistry at the Pennsylvania Agricultural Experiment Station into the nicotine content of cigarette smoke. Nicotine has been praised and condemned ever since it was first isolated from tobacco in 1888, but both praise and condemnation have had little factual basis, for the physiological action of nicotine in tobacco smoke is still a controversial subject. Before investigators can establish the effect of inhaling nicotine in smoke they must know how much of the alkaloid is present. A review of the literature shows that several factors may cause a fluctuation in the nicotine content of tobacco smoke, among which are the moisture content of the tobacco, the rate of smoking, the quantity left unburned and the nicotine content of the tobacco itself. The report of the Pennsylvania investigation, which has been reprinted from the "Journal of Agricultural Research" (Washington), deals in detail with the operations of the robot smoker, and reveals that the nicotine content of cigarette smoke varies inversely as the moisture content of the cigarettes. The amount of nicotine in the smoke is directly proportional to the strength of the puff. There is marked condensation of nicotine in the short unburned portion of a cigarette.

Bumbledom v. Understanding and Public Need

A Call for Immediate Action

To be or not to be: that is the question.
Whether 'tis nobler in the mind to suffer
The slings and arrows of outrageous fortune
Or to take arms against a sea of troubles
And by opposing end them.

MR. PUNCH has begun the year with a mordant cartoon of the task before young 1936; among the breakages upon the floor he might well have shown the Lamp of Research. May sanity come to prevail in it, in place of the stark and staring madness of its precursor. Unfortunately, too often in our country we are not governed by reason but by an uninformed authority often influenced by self-interest. Since the Great War, however, we Britons have simply screeched "Research," in all the public highways and by-ways. It has been made a protected profession, being no more nor less than a branch of our Civil Service: an assured, pensioned occupation. The leaders are made Lords and some even count among best-sellers. No cult has ever been brought to the fore more rapidly, especially in connection with commerce and the art of war, whilst the arts of peace are in no way so fully served, agriculture and health especially: bumbledom and empiricism rule in these last, whatever may be the background of knowledge: we still render but lip service to research, much as we may belaud its virtues.

Opinions Based on Ignorance

As a people, we as yet fail to value understanding; opinions are too often based upon ignorance. As an instance, the Safety in Mines Royal Commission, recently appointed, has no scientific expert upon it able to deal with the many complex issues that will necessarily come under consideration in such an inquiry. Recent public inquiries into mining catastrophies, such as that at Gresford, have been most unsatisfactory on this account. Safety in Mines needs scientific, not academic, treatment. The Minister of Agriculture has dealt with the marketing of agricultural produce entirely on political and commercial grounds, with little reference to public interests. Milk and potatoes have been to him much as primroses were to Peter Bell at the river's brim. Milk has been given to children in schools largely because it was a surplus product rather than because of its inestimable food value. None of the Departmental Committees appointed last year to deal with public food problems is fitted to deal scientifically with the complex issues awaiting consideration. Representatives of interests rather than qualified persons are too frequently appointed to these Committees: this is true particularly of the Agricultural Research Council, in no sense an expert body—not a chemist on it. Departmental Committees are almost invariably appointed from the point of view of safety—people who will smilingly sit on the fence, carefully chosen: in fact, a select body of these is generally kept at hand. The reward is an occasional knighthood. Food preservatives were abolished without due scientific inquiry; the use of poisonous "Ethyl" was also whitewashed in this way. In fact, it is not considered right to be scientific: we cultivate inefficiency in our public inquiries.

The Worst Act of Bumbledom

The worst act of Bumbledom, made worse by the support it has had from two separate Ministries, is that of the Metropolitan Water Board, in putting an end to one of the finest pieces of agricultural research work yet done, carried on in the London area, by incontinently forcing out Mr. Secrett from his market garden at Walton-on-Thames, in order merely to dig a big hole as a storage reservoir for dirty water from the Thames. Such holes might be dug in several places; no alternative site within a satisfactory distance from London is to be found for a new garden. A full account of Mr. Secrett's work, given recently before the Royal Society of Arts, is published in the "Journal" of December 14.

Mr. Secrett has not merely developed methods of growing vegetables, of the highest quality, in and out of season. He is not merely an experienced and successful grower; he is far more than this. He is specifically a genius in his subject, with an originality of outlook and breadth of view far beyond that of previous workers in the field. He has made his garden a veritable agricultural and horticultural research station. There is no other place in the Thames valley where the work could be carried on. We know such work to be of the most fundamental importance to the public health. Modern research proves incontestably that we must have proper vegetable food; yet now we have started studying the methods of producing it we are to be forced by Bumbledom to give up the work. The decision to displace Mr Secrett was taken by the House of Commons and the Water Board without allowing the scientific opinion that was proferred to be heard. The Minister of Agriculture left the House when the subject was about to be debated. The Minister of Health gave the situation away, it is said, more or less under threat from the Water Board. Neither of the two Ministers has been to see Mr. Secrett's garden; nor was it visited by the Committee of the House. The decision has been taken wholly and solely at the instance of a few engineers. It will, said Professor Armstrong, in closing the discussion at the Royal Society of Arts, be the negation of everything that has been done in this country to promote scientific research in agriculture, if this decision cannot be reconsidered and the market garden preserved. The matter was of such urgent importance that it ought to be brought before the Prime Minister and the Cabinet.

It is no mere question of saving market garden produce for the use of the metropolis—though this is of consequence. The issue at stake is nothing less than the future health of the nation—we must know without delay what is the worth of our vegetable food and how to grow it of right sorts. We have yet everything to learn of the quality of our food supplies—how far we may vary quality at will. At Walton the cards are assembled with which the game may be played to a finish—if destroyed, years must elapse before they can be reassembled. The Council for Medical Research, that for Agricultural Research, the D.S.I.R., the Royal Society are all immediately concerned in maintaining the present experiment intact. It is for bodies such as these to take immediate action.

Fertilisers in British Guiana

Bigger Yields from Sugar Plantations

BRITISH Guiana sugar planters are using more sulphate of ammonia and getting bigger yields as a result. Eighteen manurial experiment plots were reaped during 1934, and twenty-nine were in progress on December 31, according to the Director of Agriculture's annual report. The planters have been advised to continue the usual dose of 2 cwt. of sulphate for each acre of "plant" canes on the heavy clay soils, but an increase to 4 cwt. per acre is recommended for first ratoons, and on Pegasse (peat) lands 6 cwt. per acre is recommended both for plants and ratoons. "It is reasonably certain," the report states, "that the doses indicated will produce not only increased yields but increased profits." Imports of sulphate of ammonia for the first seven months of this year amounted to 5,297 tons, an increase of 615 tons over the corresponding period last year. Imports of other manures, *viz.*, manurial lime, pulverised limestone, superphosphate, potash, and basic slag, show an increase of £25,467 over the same periods.

Accident Prevention at an I.C.I. Works

Safe Working the Highest Consideration

SAFETY precautions which are taken at the Grangemouth Works of Scottish Dyes, Ltd., were described in detail by Mr. W. G. Hiscock, B.Sc., Ph.D.(Lond.), F.I.C., in a paper read before the joint Edinburgh and East of Scotland Sections of the Institute of Chemistry and Society of Chemical Industry on December 12. The principles and methods described are typical of those employed in other factories of the Dyestuffs Group of Imperial Chemical Industries.

The chemical industry, pointed out Mr. Hiscock, is fraught with more dangers than most industries. Dyestuffs manufacture, with its multitude of raw materials, reactants, intermediates and products, has as difficult a problem as any section of that industry. The I.C.I. factory at Grangemouth is entrusted with the manufacture of various dyestuffs based on the anthraquinone molecule and used in dyeing and printing cotton, wool, viscose and acetate silk. The principles involved are similar to general dyestuff manufacture, in that the final dyestuff molecule is built up through a chain of processes involving the preparation of series of intermediates.

Grouping of Processes

The problem involves the preparation of 137 intermediates, 99 parent dyestuffs, and 900 brands. Each process involves the use of such chemical plant as agitated pans, vats, stills, filtering plant of various types, agitated high pressure autoclaves, and so on. The processes are grouped together in sheds, which are fitted with shafting, a multitude of pipelines carrying steam, compressed air, vacuum, hot oil, acids, solvents, and so on. In addition, there are also cables carrying electric power for lighting, and isolated power units.

In general, the reactions which are carried out involve chemicals dangerous to the human system; their danger from toxicity or other reasons varying in degree only. In some reactions high temperatures are necessary; in others noxious gases or vapours are produced; whilst in others the reactants are corrosive.

In addition to those engaged in the production of dyestuffs, there are, of course, the usual service sections. The necessary complement of tradesmen and their labourers is employed in construction and maintenance work, either in the sheds or workshops. Their work involves the lifting and repairing of plant of all sizes, often urgently, for production or safety reasons. Their protection necessitates as much care or perhaps more than the process worker. There are those engaged in the production of steam and other services. Workers in the commercial department handle supplies of all descriptions to the sheds, the supply and cleaning of drums, casks, etc., and are responsible for the works transport and the despatch of the products.

Every Accident Reported

Before attempting to outline the actual methods employed, it must be stated at the outset that the policy of I.C.I. is based fundamentally on the principle that the people in charge of manufacturing processes are just as responsible for carrying through their processes without accident or ailment as they are for carrying them out with good yields, on time schedule and at an economic cost. Safe working is placed higher in connection with the carrying out of an operation than any other consideration. Yields and output are sometimes sacrificed at the altar of safe and hygienic working. Manufactures have been shut down completely when the possibility of danger has been found.

All safety and prophylactic measures are carried through primarily by the production chain of command. Whatever measures are employed, assistance or advice given through service sections, nothing is done to divorce the responsibility from the plant superintendents, foremen, etc., directly engaged in controlling works operations. It is, of course, unreasonable to expect the satisfactory working of this principle by just making a statement to this effect and leaving it at that; the higher management must do their share of providing instruction, and the necessary service. With this end in view, the higher command insists on the reporting of every accident or ailment, however small, so that the superintendents, foremen, etc., can put forward definite suggestions as to how the occurrence can be prevented in the future. Although these occurrences are reported from a compensation point of view, the forms used are followed up to see whether there is a weakness in our armour and whether the weakness can be remedied. Naturally all accidents cannot be foreseen or a solution found to prevent a recurrence, but subsequent investigations in the way described keep the subject before those in charge and make them think in the right direction.

Systematic Inquiry

There is no doubt that, properly controlled, inquiries into all occurrences involving accident are the most effective way of keeping down accident figures. Government inquiries into mines explosions have done more to reduce the number of explosions in mines than anything else. Similar inquiries into boiler explosions and explosives factory explosions have helped to make these occurrences rare.

Whilst the responsibility for the safeguarding of the well-being of the body of the worker at his normal occupation belongs to all links in the chain of management, the worker himself has a duty to those who have given instructions to him. He is instructed properly, and is taught as much as is humanly possible of what is going on around him: in return he knows he has a duty to himself and his colleagues to obey his instructions and report when the instructions do not meet the situation. This basic idea is now accepted and followed by all. Disciplinary action as a result of disobedience is very rare.

All workers starting in I.C.I. factories are supplied with a copy of the I.C.I. Safety Handbook for retention. Processes have all been considered carefully to eliminate unhealthy operations, *e.g.*, material is charged into cold nitrobenzene and detailed operating instructions are posted in the sheds for each process. In addition, a process record sheet is kept for each batch. It may appear that this is over-elaborate, but it is not. Both the process worker and the material being produced are very valuable, and their ultimate well-being most important. Operating instructions are also posted on machinery.

Investigation of Materials Used

A thorough investigation of all the chemicals used or produced in the works has been made. This is, of course, followed up when new processes are introduced. In collaboration with the Works Medical Officer all the available literature has been examined. In the case of all these materials an instructional sheet has been drawn up giving details of their action, precautions to be taken, symptoms to be looked for and first aid treatment.

Chemical processes carried out in properly designed plant by intelligent workers, said Mr. Hiscock, should be as conducive to good health as any normal industrial process. All the plant at Grangemouth has been constructed or reviewed from time to time from a point of view of the possibility of danger. Systematic inspection by a full-time plant inspector, appointed by the Engineering Department, is continually being applied. Unexpected happenings are reviewed and the possibility of a recurrence ruled out as far as possible.

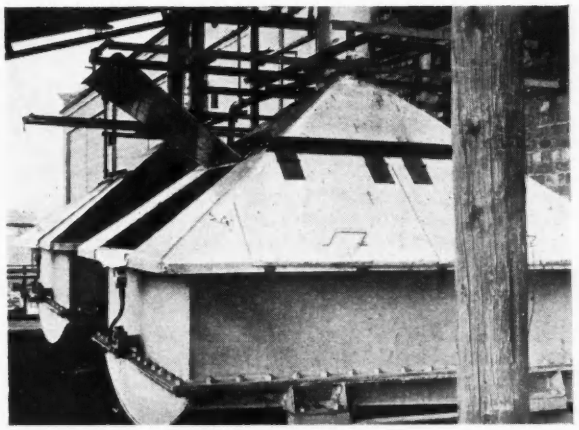

Fig. 1. Vented Vacuum Filter.

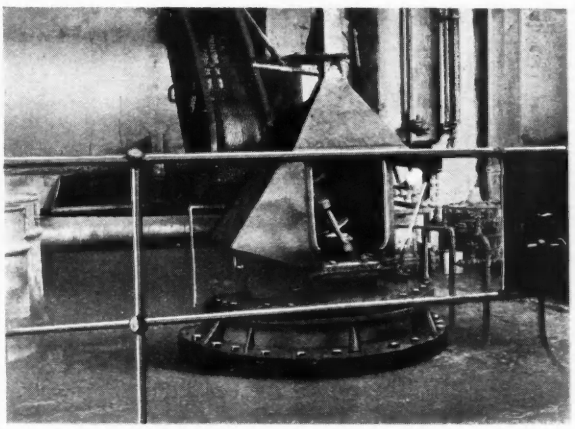

Fig. 2. Vented Charging Hole.

The chief endeavour is to keep the shed atmosphere clear of any harmful gases or vapours. This is done primarily by covering and draughting of all vessels to the open air. Fig. 1 shows a vented vacuum filter. Unfortunately the procedure is not successful in all cases, especially where the vessels have to be opened for charging, inspecting, and so on. It may be possible to employ devices such as shown in Fig. 2, where a strong draught of air by a fan is drawing air over the charging hole. Where such devices fail, the whole plant or part of it is placed in the open air. In one case the plant concerned employs a process in which the solvent used is hot aniline. Here draughting cannot be relied upon, so that it is considered there is no alternative but to place the offending plant in the open air, against the wall of a shed in which other parts of the plant are located, communicating doors being kept closed.

Many of the Grangemouth processes employ nitrobenzene as solvent. Formerly, those processes were scattered throughout practically every shed in the works. Workers from all sheds were affected and the position became serious, particularly during hot weather. The problem was solved by grouping these processes into one shed in suitable plant, and removing as much of the shed walls as possible. The most undesirable operations are now actually carried out outside the shed. By this arrangement the number of workers exposed is limited, and they can be suitably clothed to face the more rigorous conditions.

In plant designing for chemical processes a very important essential is to cut down handling of chemicals as much as possible. Corrosive liquids and solvents should be stored in closed vessels ventilated suitably outside; they should be conveyed in closed pipe-lines, subsequently measured in suitable measuring vessels and delivered to the reaction vessels through closed pipes. Sight glasses should be introduced instead of tundishes. Acid handling has always caused a large number of minor accidents, and a complete set of regulations covering all phases of acid handling has now been introduced. The "bucketing" of acids is forbidden, except in the experimental plant, where specially designed buckets are used.

In the design of a plant for a new product, or the rebuilding of an old plant, the works appoints a plant design committee, who study and advise from every aspect on the design of the plant. The protection of the worker gets first thought, not only from a point of view of protecting him from gassing, splashing, and so on, but also from the point of view of comfort in working and the expending of energy. For example, the maximum height of charging manholes must not be greater than 2 ft. 3 in.

The protection of the worker against the unexpected is, of course, of paramount importance. As already stated, unfortunately chemical operations do not always go according to plan. From this point of view every operation in the factory has been studied and scheduled for protective clothing and appliances. These schedules are approved, and copies are in the possession of the Labour Department and the shed superintendents. By constant education and discipline no difficulty is found in persuading the workers that instructions must be obeyed. A complete change of clothing, including underwear, is supplied for certain processes; overalls for others; whilst rubber boots are provided for most process workers. A typically clothed worker is shown in Figs. 3

Fig. 3. Pulvasorb Mask.

Fig. 4. Ardeer Mask.

Fig. 5. Antipoys Mask.

Fig. 6. Salvus Apparatus.

Fig. 7. Safety Belt.

and 4. Goggles are scheduled for many operations involving the use of such reagents as acids and caustic alkalies.

Gloves and sleeves are also scheduled for many processes. *For general process work* the hands are given a treatment of a lanoline preparation and then covered with stockinette gloves, followed by rubber gloves and sleeves. Rubber gloves alone are not allowed, owing to the fact that they induce sweating and modern rubber contains chemicals of doubtful action on the skin. *For certain processes,* such as handling phthalic anhydride, cotton stockinette gauntlets are scheduled. In some of the heavy engineering jobs, such as welding steel plate, special gloves are provided.

Masks and Respirators

Masks and respirators of standard types are scheduled. *For dust and mists* there is the "Pulvasorb" respirator (Fig. 3). *For gases and vapours* the "Ardeer" mask—an I.C.I. product—is of great use (Fig. 4). In this apparatus compressed air from a clean source is distributed over the face. This mask has the advantage not only of supplying fresh air, but the air is cool; moreover, the skin is completely protected. It gives complete protection in case of spills, sudden evolution of gas, and so on. The "Antipoys" mask, in which the air is inhaled through a pipe from outside the shed is shown in Fig. 5. *For closed vessels and general rescue work* the "Salvus" oxygen breathing apparatus (Fig. 6) is used. Canister gas masks are not allowed, as their effective life, even when re-charged, is doubtful in concentrated atmospheres; after storage the effectiveness of a canister is also an unknown quantity, even in dilute concentrations. Fig. 7 shows a typical safety belt and life line which is also worn when working at unsafe heights involving the risk of a fall.

Electrical equipment at Grangemouth has been installed from the point of view of suitability for a chemical factory. Points which have been given serious attention are (1) installation of cables of safe current carrying capacity and switchgear of adequate rupturing capacity; (2) planning of power distribution networks with control and overload protection for all circuits; (3) provision of isolating links for safety when working on the line; (4) provision of overload and no-volt trips on all motors; (5) balancing of lighting load on the three phases; (6) earthing for static discharging; (7) earthing of all metal parts which could possibly become "live" through breakdown of insulation; and (8) emergency stop pushes for line shafting. This electrical equipment is, moreover, under constant inspection.

First Aid Classes

All workers are encouraged to take first aid classes, outside working hours, under the works medical officer. I.C.I. have specialised in this subject and encourage the men by monetary grants for attendance and efficiency.

In each I.C.I. works a safety officer is appointed. He is usually the works labour manager. His functions do not conflict with the operation of the principles of responsibility down the line of management, as his duties are to inspect and give advice. He is conversant with all I.C.I. methods and is expected to see that they are operating properly.

All I.C.I. works also have a works council, consisting of equal numbers of staff appointed from the management and workers elected at an annual election by the workers only. The labour manager acts as its secretary, and the medical officer attends. From this works council is appointed a safety sub-committee, which has powers to co-opt other workers when necessary. Again the labour manager acts as secretary, and the medical officer attends all meetings. This committee holds regular meetings and tours of inspection of the works. In the case of the former they discuss all matters pertaining to safety of immediate interest, all recent works accidents, statistics, publications on safety matters, and they advise the management of their views. In the case of the last mentioned, they raise points which have been missed or suggest improvements again as their views to their management.

The views submitted by the safety sub-committee are transmitted to the departments concerned for consideration and possible adoption. Since the suggestions put forward represent carefully considered views of both workers and staff they are usually adopted. Occasionally, after department consideration, the pros and cons are put forward to the higher management for decision. The fact that these discussions are held conjointly with the workers stimulates interest all round. Experience has shown at Grangemouth that the workers' representatives on the safety sub-committee have been each year extremely useful preachers of the "Gospel of Safety" among their fellow workers. They have taken an intelligent interest in the subject from every angle, and have not been afraid to assist the management in the spreading of propaganda and the maintaining of enthusiasm.

British Chemical Plant Exhibition

Preparations for June Display in London

IN July, 1931, the British Chemical Plant Manufacturers' Association organised a very successful exhibition of British chemical plant and apparatus at the Central Hall, Westminster, in connection with the jubilee celebrations of the Society of Chemical Industry. Since then, references have been made from time to time to the desirability of repeating this exhibition; in particular the opinion has been expressed in certain quarters that there should be a section for chemical plant at the British Industries Fair. The industry itself is of the definite opinion that the best results are obtained by organising an exhibition in conjunction with some chemical or chemical engineering gathering, because the double attraction brings a much larger number of interested visitors, both from home and overseas. At the same time a number of firms regularly exhibit at the Birmingham section of the B.I.F., but these invariably have considerable interests outside the strict conception of chemical plant, and it is on account of these interests that they generally exhibit.

In 1931 an agreement was reached with the corresponding associations of French and German chemical plant manufacturers to hold an exhibition in rotation in each country, so as to avoid clashing. Owing to the abnormal conditions caused by the depression it has not been possible to adhere strictly to this arrangement, but clashing has been avoided. The German Achema VII was held in May, 1934, while the next exhibition of British chemical plant will be held from June 22 to 27, 1936, at the Central Hall, Westminster, in connection with the International Chemical Engineering Congress of the World Power Conference. The congress and the exhibition will be held in the same building, and it is hoped that this proximity will offset to some extent the admitted drawbacks of this particular hall from the exhibition point of view. The Department of Scientific and Industrial Research has also undertaken to organise a research exhibition on similar lines to the one which was so successful in 1931, to show the benefits of organised research to industry.

The theme of the combination of congress and exhibition will be chemical engineering in all its numerous ramifications, with special emphasis on the part played by the United Kingdom. Some twenty countries, including those of greatest industrial importance, will be participating in the congress, so that the occasion will be unique and one of which the manufacturer of British chemical plant ought to take full advantage. The total exhibiting area will be about 13,000 sq. ft., and the charge for space will be 3s. 6d. per sq. ft., which will include all costs of unpacking the exhibits, handling them into the hall and placing them on the stands, storage of packing cases, and the reverse operations. Regulations for the exhibition and the forms of application for space can be obtained from the British Chemical Plant Manufacturers' Association, 166 Piccadilly, London, W.1.

Essential Requirements of Air Dust Filters

By S. C. BLACKTIN, Ph.D., M.Sc.

THE severe prevalence of some form or other of dust disease in almost every conceivable industry is really but one aspect—the industrial view—of the universality of dust throughout all the affairs of life. Recognising this fundamental, it then becomes necessary to press on with practical measures for curing the dust disease evil in industry.

Although respirators have been long in use they have in general suffered from two chief drawbacks. In the first place there is the discomfort and inconvenience in wearing which has caused workers to decide that it is better to risk danger than be thus handicapped; secondly, the interference in breathing, regarded not merely as a discomfort but as a positive nuisance. It should be noted, however, that these objections on the part of wearers, whilst they are indirectly, are not directly concerned with the efficiency of the respirator as a dust filter, for it would be relatively easy to remedy these practical defects by incorporating a totally deficient dust filtering unit. The great difficulty which has so far not been finally overcome to the limit is to decrease the above practical defects to a minimum at the same time as the dust-filtering efficiency is increased to a maximum—all in the very restricted space available. The objection of Collis and Greenwood* against respirators in general, that the dead space in front of the nose and mouth retaining expired air causes deeper breathing to eliminate the normal amount of carbon dioxide, is perhaps chiefly one of the problems of comfort and convenience. In this article it is rather the other aspect of the efficiency of the dust-filtering material itself which is considered.

The essential characteristics of any dust filtering material which make for full efficiency when maximally satisfied are: (i) High percentage protection against dust allied to low breathing resistance, considered alongside the degree of susceptibility of the material to moisture absorption from breathing; (ii) the variation of degree of protection and resistance of the material with continuing wear and use; and (iii) suitability of the filtering material for repeated cleaning and re-use. All these desiderata enter to a greater or lesser extent into the commercial and industrial aspect of filtering efficiency.

High Protection with Low Breathing Resistance

If resistance is ignored, it is comparatively easy to obtain high protection with many materials by simply increasing the density of packing of the material in the space available, *i.e.*, by simply increasing weight per unit volume. Of course, this ratio will vary from material to material dependent on the porosity, specific gravity, general nature and dimensions of the constituent units of any given material whether such units are fibres, particles or collections of either—independent or mixed. A further controlling factor is the relative disposition of such units amongst themselves, *i.e.*, the manner of packing. The ideal material, however, whilst having a low weight per unit volume, will simultaneously possess fibre or particle units, or mixtures thereof, as the case may be, of highly suitable physical and chemical nature, dimensions and relative disposition.

All research to find the perfect dust filtering material is directed, as a first step, to the finding of an optimum combination of such qualities. If, for example, the dust cloud density before test—carried out by passing a suitable dust cloud through the material under test under a suction which simulates human breathing is, say, 50 milligram of material per cubic metre, reduced by the test to 10 milligram per cubic metre, protection has an efficiency of 80 per cent. But the criterion is the pressure or suction figure at which this is attained. If, say, 1 inch water gauge, then a comfortable material of high efficiency is found; but if, say, 3 inches, the high protection efficiency would be useless in practice. The criterion in comparing protective values of all kinds of different materials is, therefore, always that of resistance. High protection without suitably low resistance is valueless. Some materials will both absorb and condense moisture. Whilst, therefore, moisture taken up in the filtering material is liable to vary protection and resistance, a high figure of merit (*i.e.*, high protection allied to low resistance) will only be maintained where the fibre or particles of the filtering material are maximally fitted to resist moisture.

Variation of Degree of Protection

Since any filter which is stopping dust must gradually clog with use, an ideal filter would be one where, whilst resistance remains constant, protection gradually increases with a consequent rising figure of merit. But the best filter ever likely to be met with is that where rate of increase of protection ratio to resistance increase, over successive equal time periods, gives the highest rate of increase over such periods. That is where protection due to clogging is increasing faster than resistance due to clogging. But, at the same time, the upper comfort limit of resistance must not be passed in this competition, and the lower the range of resistance over which competition occurs the higher the efficiency. In seeking suitable materials for dust respirators, therefore, this double factor of rate of rise of resistance with rate of rise of protection, with a low range of resistance, must be carefully kept in view. For the life period, in use, of a filtering material is, industrially, very important, since on it depend the frequency of time and trouble spent in making replacements, and the amount, hence cost, of material required for use over any given period.

Cleaning and Re-use of Filtering Material

The possibility of cleaning and re-use of filtering material may be of great importance as regards, say, silicosis prevention. For where a manufacturer has to choose between an old, inefficient but customary material which might be cleaned and re-used; and a new, efficient material which might not: force of habit and conservative outlook may combine with financial economy to counteract in his view, the advantage of efficiency. Efficiency has not necessarily the same meaning to both the empirical and scientific outlooks. Probably, therefore, an efficient dust filtering material which can claim the additional advantage of economy in use is thereby constituted a still more efficient material. The materials which resist moisture in use will resist it in cleansing, so that their cleansing will probably be carried out with organic solvents. But since fatty moisture-resisting components ought to be retained, an organic cleanser in which fats or oils are least soluble is indicated. Alcohol is often useful, but cases should be decided on their merits.

The increasing prevalence of dust diseases, whether of mild or severe nature—and the scope increases as fresh countries enter the industrial race—and whether in industrial pursuits or in everyday living clearly indicates the great research field open before respirators of maximum efficiency are practicable, an aim of considerable scientific and technical importance. This increasing incidence is, perhaps, more particularly marked in the sphere of industrial silicosis-consciousness which, quickly increasing, is bringing more and more industries under legislative notice. The cure for silicosis and its allied diseases, such as asbestosis, is the discovery and practical application of a dust filtering material which is *maximally* capable of arresting the very fine, most dangerous, particles of, say, 1 micron, *i.e.*, 0.001 mm. diameter or less, or thereabouts.

* Collis and Greenwood, "The Health of the Industrial Worker," p. 300 (Churchill).

Standardisation in the Chemical Industry

Work of the British Standards Institution in 1935

A CONSIDERABLE advance has been made during the past 12 months in the standardisation work undertaken by the Chemical Division of the British Standards Institution. A series of vegetable oil specifications covering cocoanut, ground nut, olive, rape seed, and raw linseed oils have been issued together with standard methods for the sampling of fats and fatty oils in packages or in bulk. The sixth meeting of the International Commission for the Study of Fats took place in 1935, in London, the Chemical Division of the Institution for the first time acting as hosts. The Commission has directed its efforts towards the unification on an international basis of the methods of analysis of fats and their derivative substances and substantial progress was made at the London meetings. As a result of this meeting the Commission is about to approach the Union International de Chèmie with a view to becoming a member of that organisation.

Laboratory Ware

Substantial progress has also been made in the section dealing with laboratory ware and scientific glassware in which the committees are proceeding in close co-operation with the National Physical Laboratory. Standards have been issued covering measuring cylinders, Crow receivers, Nessler cylinders and test tubes for bacteriological purposes and laboratory, incubator, water bath and oven thermometers. A large amount of work is still in hand in regard to hydrometers, pipettes, and other glass apparatus, porcelain ware and silica ware.

One of the most important standards issued in the past year is that dealing with carbide of calcium, prepared in close co-operation with Dominion interests concerned, as well as with the collaboration of the European manufacturers of carbide. The genesis of the work arose in 1931 out of a request for approval of a draft specification prepared by the Standards Association in one of the Dominions. Whilst this draft differed from the standards and regulations of the British Acetylene Association, which had been operative for some thirty years, the Council of the B.A.A. agreed to co-operate with the B.S.I. in the preparation and establishment of a British standard specification for carbide, based upon their own standards, conditions of sale and purchase and the trade usages in the industry.

Another important standard is that covering methods of testing glues, which has been prepared in close co-operation with the Federations of Bone Users and Allied Trades and of Hide, Gelatine and Glue Manufacturers. The physical and chemical properties of glue depend, first, on the nature of the raw material, and, secondly, on the methods of processing. It was not found possible to draw up any simple tests which would evaluate completely the quality of a glue, or its suitability for a particular trade. Granted, however, that the glue was made from a specific type of raw material by a standard method of manufacture, then the tests included were recommended as providing indications of the behaviour of the glue in use, and which might be taken as reliable criteria of the quality of different deliveries.

Testing of Gelatine

A committee has been appointed to consider the preparation of British standard methods for the testing of gelatine. This committee has before it the work carried out by the Federation of Hide, Gelatine and Glue Manufacturers who have submitted draft methods as a basis for discussion. It is anticipated that this will greatly facilitate the work of the committee. At the instance of the British Plastics Federation consideration is also being given to the question of the preparation of a comprehensive standard for synthetic resin moulded materials and moulded articles for general purposes. Revisions have been completed of the specifications for carbolic acid and for refined cresylic acid. Five grades of refined cresylic acid have been provided for, while the carbolic acid specification provides for four grades of crude, dehydrated, and distilled acids.

The revision is nearing completion of the British Standard Specification No. 144 for creosote for timber preservation purposes, while the committee is revising the British Standard Specification No. 135 for benzol for motor fuel. The revision is following the lines of the National Benzol Association specification and will include grades for all general purposes. Early in the year a British standard specification was issued dealing with the sampling of coal tar and its products.

In the leather section a specification is nearing completion for vegetable tanned sole leather, and in this work the committee has been greatly assisted by the British Boot and Shoe and Allied Trades Research Association.

Test for Disinfectants

A special panel in the disinfectant section has had under examination the technique of the Chick Martin test for disinfectants. A good deal of experimental work has been carried out and it is hoped to present a report to the full committee early in the new year. In this section a special panel has also been appointed to consider the question of the preparation of a standard technique for laboratory tests on the toxicity of wood preservatives.

A good deal of work has been carried out in the dairy standards section. Standards are nearing completion for the technique of the Babcock and Gerber tests, together with the apparatus used, while both chemical and bacteriological methods of analysis of butter, cheese, and other dairy products are in course of preparation.

The closest liaison is being maintained between the Society of Public Analysts and the Dairy Standards Committees and in accordance with the arrangement that has been made, the detailed work in regard to the preparation of a standard method for the determination of the freezing point of milk has been referred to the Society for consideration.

A special sub-committee has been set up to consider the preparation of British standard methods for the sampling of dairy products.

Radium Products in Canada

Statistics for 1934

FINALLY REVISED STATISTICS relative to the commercial production of primary radium and uranium products in Canada in 1934 show that the Port Hope (Ontario) plant of Eldorado Gold Mines, Ltd., received from the Great Bear Lake Mine, North-West Territories, seventy-seven tons of pitchblende-silver ore and seven tons of silver concentrates. Twenty-six tons of ore were treated during the year with a recovery of radium, uranium, silver and lead, the value of which is believed to have reached $210,000. The Port Hope plant was in continuous operation in 1934. The two ore-bodies under development by the company are estimated to contain ore to a value of $2,400,000. Other companies engaged last year on the development of pitchblende deposits at Great Bear Lake included Bear Exploration and Radium, Ltd., at Cameron Bay from which a test shipment of three tons of silver ore was made to the Trail Smelter, British Columbia. Great Bear Lake Mines, Ltd., reported no actual shipment of ore in 1934. Canada Radium Mines, Ltd., operating near Cheddar, Haliburton County, Ontario, continued its operation during the year, but made no ore shipments.

Hydrogen Production by the Badische Process—VII.

Removal of Carbon Dioxide and Sulphur

In continuation of notes on the Economics of the Synthetic Manufacture of Ammonia, published in "The Chemical Age," October 5 to November 16 inclusive, the present series deal particularly with the design of the plant for the production of hydrogen by the Badische Process.

ANY sulphur compounds remaining after the iron oxide box treatment would be removed by the water washing, which is important from the point of view of the freedom from sulphur required of the gases for the Haber plant. Suppose there were 0.3 per cent. H_2S, the partial pressure would be $20 \times 0.003 = .06$ atm. The solubility is 2.67, so that

$2.67 \times 0.06 \times 720 = 123$ cu. ft. per minute could be removed,
$= 177{,}000$ cu. ft. per day,

which is more than the quantity of H_2S present in the total gas. As before pointed out, water washing alone would, therefore, probably suffice; but several reasons have been advanced against relying on this entirely for such purpose.

Plant Required

Plant required for removal of 4,910,000 *cu. ft. of* CO_2 *per day.*

Six 3-stage compressors, 2,000 cu. ft. 30 atm. (two spares).
Twelve scrubbers 10 ft. × 6 ft. ring filled.
Four pumps multistage centrifugal for 1,500 gal. per minute, 30 atm.
Pelton wheels and generator (one spare pump).
Water reservoir.
Expansion engines.
Gasholder, 500,000 cu. ft., or two gasholders each 250,000 cu. ft.

Quantities of Power, Water, etc.

Power maximum 4,000 h.p. (actual 3,250 h.p.).
Water maximum 6,000 gal. (actual 4,500 gal. per minute).
The most economical pressure appears to be 15-20 atm. (This point and the power required has been examined from several points of view.)
Notes on the solubility of CO_2 and other gases in water and other solvents are included.
The removal of sulphur is best done before the compressors in the water gas catalysis section, about 16 boxes (45 ft. × 40 ft. × 6 ft.) being required.

Investigations.

Rate of absorption of CO_2 in water.
Ratio of solubilities of H_2/CO_2 at various pressures in water.
Means of removal of water from pressure scrubbers.
Calculation of size and strength of mains, etc., for gas under pressure.
Scrubber design.
Means of recovery of power from issuing hydrogen.

Purification by Fractional Combustion

The only gas remaining to remove is CO. This will be best done by fractional combustion, *i.e.*, combustion of the CO in presence of hydrogen. The economic advantage of such a method over pressure washing with cuprous ammonium chloride or sodium hydrate has already been discussed. The CO by this means is burnt to CO_2 which is subsequently removed by lime. There remains nitrogen which is required, a small percentage of argon and methane, the quantity of which should be kept from the start (*i.e.*, in the water gas) as low as possible. The catalyst preferentially promotes the reaction,

$$2CO + O_2 \quad 2CO_2$$

at a temperature about 250° C. The action

$$2H_2 + O_2 \quad 2H_2O$$

also takes place and removes the excess of oxygen. But the rapidity of the first action is greater and the removal of the CO is, under suitable conditions, complete. At temperatures above 300° C. the latter reaction becomes more rapid, the steam reacts on the CO and the water gas equilibrium is set up, so that the removal of the CO is not complete.

The composition of the gas being 90 per cent. H_2 and about 3 per cent. CO and 7 per cent. other gas, the specific heat would be about 1.5; suppose that 1 volume of steam and 15 per cent. air are added. The heat evolved when 28 lb. of CO burn to 44 lb. of CO_2 is 68,000 C.H.U., and when 2 lb. of H_2 burn to 18 lb. of H_2O, 58,000 C.H.U. are evolved. Suppose 3 per cent. CO are burnt and 3 per cent. H_2 out of 1,000 cu. ft. of gas, *i.e.*, $\frac{30 \times 2}{385}$ lb. H_2, and $\frac{30 \times 28}{385}$ lb. CO, *i.e.*, 0.156 lb. H_2 and 2.18 lb. CO or

$$\frac{0.156 \times 58{,}000}{2} = 4{,}500 \text{ C.H.U.} + \frac{2.18 \times 18{,}000}{28} = 5{,}100 \text{ C.H.U.}$$

$= 9{,}600$ C.H.U.

The heat required to raise 1,000 cu. ft. of the gas to the reaction temperature 250° would be about (density=0.012 lb.)

$$1{,}000 \times 0.012 \text{ lb.} \times 1.5 \times 250 = 4{,}100 \text{ C.H.U.}$$

It is evident therefore that even burning so small a quantity of the gas would be more than sufficient to heat up the whole of the gas to the reaction temperature. It is evident, therefore, that it is necessary to control the evolution of heat, if the reaction temperature is to be maintained.

It was found necessary to add even half a volume of steam to the gas leaving the water gas catalyst which contained about 1 per cent. of CO and very little CO_2; the steam acting mainly as a diluent to take up the heat of reaction. It was found that if the steam was not added, the temperature of the catalyst rose, when more hydrogen burns the temperature rising still further and tending to set up the water gas equilibrium, thereby making it impossible to remove all the CO. Other experiments have been made on gas containing 2 to 3 per cent. of CO and 30 per cent. CO_2 and the CO has been removed down to 0.8 per cent. by the addition 10 per cent. of air and 1 volume of steam at about 270° to 300° C. The temperature of the catalyst varied considerably which is to be expected; there is one particularly hot zone.

On the small scale, one is relying on the radiation to dissipate the heat and there are sure to be local centres where the temperature conditions are not the optimum. About 250° C. appears to be the best temperature to burn out the CO. On the large scale such difficulties could be largely avoided.

Experiments so far have indicated that (1) it is possible to remove *all* the CO at 250° by preferential combustion provided the temperature can be controlled when there is very little CO_2 present; (2) it is possible to remove down to 0.3 per cent. of CO when there is 30 per cent. CO_2 and 1 volume of steam, but whether it is possible to remove all the CO_2 under more even temperature conditions is not yet determined.

The reactions which can take place are:—

1. $H_2O + CO \quad CO_2 + H_2$ (Water gas equilibrium)
2. $2H_2 + C_2 \quad 2H_2O$
3. $2CO + O_2 \quad 2CO_2$

To what extent the excess steam and the excess CO_2 play a part in determining the completeness and incompleteness of the third reaction requires looking into theoretically and experimenting on practically, but I am inclined to think with so large an excess of CO_2 that the complete removal of the CO will not be attained unless a rather large and uneconomic quantity of steam is employed.

In so far as the CO_2 acts as a diluent to take up the heat, its presence is all to the good; but the space velocity of the catalyst will be diminished and the plant would have to be larger, not only to the extent of being able to deal with a larger volume of gas, but also due to the lower space velocity of the catalyst.

From all points of view, considering also the effect of traces of sulphur on the fractional combustion catalyst, therefore, in these notes I have favoured the washing out of the CO_2 *before* the fractional combustion, but if later it is found the removal of CO *can* be made complete when the CO_2 is present and provided little steam has to be added, the water washing could always be done after the fractional combustion; thereby saving a considerable amount of lime and making it possible to take the hydrogen and nitrogen direct to the Haber compressors without letting down the pressure. Then again, the quantity of steam added may act as a delayer of the second reaction to some extent, as well as a diluent to take up the heat, and more might have to be added, when taking out the 3 per cent. CO than was used where only 1 per cent. CO had to be taken out.

In these notes it will be assumed that (1) if the temperature is maintained between 250° and 270° C. the CO can be burnt preferentially; (2) one volume of steam will be added per volume of gas entering; and (3) the nitrogen can be added to the gas before the fractional combustion, so that any oxygen contained in it will be removed and so that it may help to act as a diluent and possibly make it unnecessary to add so much as 1 volume of steam.

Volume of gas.—7,750 cu. ft. per minute at 20° C. = 14,000 cu. ft. at 270° C. = 12,700 cu. ft. at 16.7 lb. pressure.

Volume of steam = 12,700 cu. ft. at 270° C. at 2 lb. plus pressure.

Density of steam at 270° C. (superheated) = 518° F.

$$= \frac{1.684 \times 16.7}{518 + 460} = 0.0287 \text{ lb. per cu. ft.}$$

Therefore quantity of steam = 12,700 × .0287
= 364 lb. per minute,
= 234 ton per day
= (33.5 tons coal per day)
(= 0.94d. per 1,000 cu. ft. H_2).

Heat required to raise 7,750 *cu. ft. of gas* of above composition from 20° C. to 270° C. = 7,750 × 0.0124 × 1.425 × 250 = 34,200 *C.H.U.*

Heat required to raise 364 *lb. of steam* from 102° C. to 270° C. = 364 × 0.47 × 168 = 28,600 *C.H.U.*

Heat given out by reaction.—The quantity of oxygen in the air added has been made equivalent to the CO burnt in all the experiments, *i.e.*, double the quantity of air required. It may well be that if the temperature is properly controlled this excess could, with advantage, be reduced. The remainder of the oxygen is burnt to water at the expense of the hydrogen. In this case, there will be 381,350 cu. ft. of CO to remove per day = 381,350 cu. ft. O_2

= 1,906,750 cu ft. of air.
= 1,322 cu. ft. per min. at 20° C.
= 264 cu. ft. of oxygen.

$$= \frac{264 \times 32}{385} = 21.9 \text{ lb. of oxygen per min.}$$

$$\text{Density} = \frac{1.3253 \times 34''}{459.6 + 68°\text{F}} = 0.0852 \text{ lb. per cu. ft. at 16.7 lb. pressure and 20° C.}$$

Density of gas.			Specific Heat.		
60% H_2	= .9 × 2	= 1.80	H_2	1.8 × 3.4	= 6.1
3.4% CO	= .034 × 28	= .95	CO	0.244 × 0.95	= 0.23
5.2% N_2	= .052 × 28	= 1.45	N_2	0.240 × 1.45	= 0.35
1.3% CO_2	= .013 × 44	= .57	CO_2	0.236 × 0.57	= 0.13
	4.77			4.77	6.81 = 1.425 C.H.U. per lb.

$\frac{4.77}{365}$ = 0.0124 lb. per cu. ft.

Now if the reactions $2H_2 + O_2 = 2H_2O + 58{,}300$ and $2CO + O_2 = 2CO_2 + 68{,}100$ take place to the same extent, for each mol. of oxygen burnt

$$\frac{58{,}300 + 68{,}100}{2} + \frac{126{,}400}{2} = 63{,}200 \text{ C.H.U. are evolved.}$$

Therefore *heat evolved by reaction per min.*

$$\frac{63{,}200}{32} \times 21.9 = 43{,}400 \text{ C.H.U. per minute.}$$

Heat required to raise 1,322 *cu. ft.* of air at normal pressure, from 20° C. to 270° C., = 250 × 0.0852* × 1,322 × 0.244 = 6,850 *C.H.U. per min.*

Therefore *total heat required to raise reactants to temperature* is 34,200 + 28,600 + 6,850 = 69,850 *C.H.U. per minute.*

69,650 *C.H.U. per minute.*

So that only 69,650 + 43,400 = 26,250 C.H.U. would have to be provided,
and the *outgoing gas* would carry 69,650 + 43,400 = 113,050 *C.H.U. per min.*

If, however, the temperature is maintained constant at 270° C., and the gas leave the system at 100° C., the heat given out in the interchange cooling over this range would provide an amount of heat which can be obtained as follows:

Composition of issuing gas.

H_2 .. 10,030,000 − 381,350 = 9,648,650 cu. ft. per day, 78.4 − H_2
CO_2 .. 381,350 + 147,000 = 528,350 cu. ft. per day, 4.3 − CO_2
N_2 .. 578,100 + 1,524,000 = 2,102,100 cu. ft. per day, 17.1 − N_2

A (say) 2,300 + 19,067 (say) 21,500

12,300,600

It is obvious the hydrogen will, under the conditions assumed, contain a considerable quantity of nitrogen, this is all to the good in the case of the Haber process, most of the nitrogen being produced at no cost.

Heat given out by gas in cooling from 270° *to* 100° *C.*

$\frac{12{,}300{,}600}{1{,}440}$ = 8,550 cu. ft. per minute × .0214* = 183 lb. per min.

183 × 0.84* × 170 = 26,700 C.H.U. per minute.

Heat given out by 364 lb. steam + $\frac{21.9}{2} \times \frac{18}{16}$ lb. afforded by the reaction = 376 lb. steam in cooling through the same range would be 376 × 0.47 × 170 = 30,000 C.H.U. per minute. *So that heat available from this source is* 56,100 *C.H.U. per min.*

Heat required to raise gases and steam to 270° C. = 69,650 C.H.U./min.

Heat available from gases and steam issuing = 50,700 C.H.U./min.

Heat available from reaction = 43,400 C.H.U. per minute.

There is *therefore an excess of* 94,100 + 69,650 = 24,450 C.H.U. per minute.

Therefore the interchanger would only have to work at about 50 per cent. efficiency. The reaction heat would cause the gases to become too hot, unless some cooling was made to take place between the various layers of catalyst.

Density of gas.

H_2	78.4 × 2/100	= 1.568
CO_2	4.3 × 44/100	= 1.89
N_2	17.1 × 28/100	= 4.78
		8.24

$\frac{8.24}{385}$ = 0.0214 lb. per cu. ft.

Specific heat.

1.568	× 3.4	= 5.33
1.89	× 0.236	= 0.44
4.78	× 0.240	= 1.15
		6.92

$\frac{6.92}{8.24}$ = 0.84.

Notes and Reports from the Societies

Society of Chemical Industry

Bristol Section : Fused Silica and its Applications

RECENT developments in the application of fused silica were outlined by Mr. G. E. Stephenson, M.Sc., Ph.D., A.I.C., of the Thermal Syndicate, Ltd., in a paper read before the Bristol Section of the Society of Chemical Industry on January 9.

Introductory reference was made by the author to the pioneer work on fused quartz done at Bristol in the early years of this century by Shenstone, Gifford, Kent and Lacell. Subsequent discussion was confined to developments during the past five years, first dealing with applications such as flame-proof domestic cooking ware, electric immersion heaters for acids and acid liquors and the new vitreosil direct-fired tower concentrator for sulphuric acid, all of which depend on the well known heat and acid resisting properties of fused silica. Electrical properties were discussed in relation to the extensive use of fused silica, both translucent and transparent forms, in electrostatic fume and dust precipitators, mercury arc rectifiers and generally as an outstanding electrical insulator. Recent data on gaseous diffusion through the material were discussed with respect to applications in pyrometry and to metal wire heat treatment under vacuum.

Passing to the improvements effected in the transparent material now produced for optical and astronomical work, reference was made to the increasing use of the material for research and industrial work requiring ultra-violet light. New types of mercury vapour discharge lamps having fused quartz envelopes were exhibited and discussed, their advantages being robustness and portability, and also that they are self-starting without tilting. Quantitative spectrum analysis data on mercury vapour lamps determined in the laboratories of the author's company were exhibited and discussed in relation to the application of the mercury lamp in research and industrial irradiation work.

London Section : Specifications for Asphalt

SPECIFICATIONS for asphalt were the subject of a paper which Mr. W. J. Hadfield, M.Inst.C.E., City Engineer of Sheffield, read at a joint meeting of the London Section and the Road and Building Materials Group of the Society of Chemical Industry on January 6. Dr. H. E. Cox (Chairman of the London Section) presided.

In the first place, Mr. Hadfield declared himself a great believer in standardisation, and said there was ample room for further efforts in the right direction. He had in mind, however, that where natural products were concerned, there were limits to useful standardisation. The claim that the revised asphalt standards were a great improvement on the previous ones probably would be based chiefly on the fact that in several directions they allowed less latitude. This, of course, was consistent with the basic principle of standardisation, but it also illustrated the difficulty of standardising natural materials. For example, in regard to the grading of aggregates, the new specifications represented the solution of a difficulty, and due credit should be given to Colonel Hughes, County Surveyor of Hampshire, who had suggested that solution. Probably no better one could have been found; but the specifications attempted in a measure to standardise something with infinite natural variations, *i.e.*, stone.

Mr. Hadfield invited chemists to tell the engineer how he could distinguish an unsuitable bitumen, and what there was to guide him, beyond his own experience. Different bitumens gave different results. Apparently the best explanation that any chemist could give was that, while the specification indicated what the bitumen must contain, it did not indicate what had been taken out. Therefore, in applying the specification, the engineer must again rely on his experience or on that of the contractor, in selecting a suitable bitumen—and that could scarcely be regarded as a method associated with standards. Although the committee which had prepared the asphalt specification had devoted much time to fillers, ultimately nothing but cement was agreed upon, with the reservation (again it became a matter of discretion—not a standard) that the engineer might specify "other mineral matter;" and it was laid down as a hard and fast rule that in the case of mixture for the wearing surface the filler should be added after the aggregate and matrix had been mixed. Mr. Hadfield said he had always doubted whether the latter condition was necessary. In making hundreds of thousands of tons of asphalt he had never followed such a practice.

A number of speakers in the discussion urged the need for revision of the asphalt specifications in the near future. It was felt by some that if a specification were to serve a useful functional purpose it should not give wide permissive powers; but, on the other hand, there were those who appreciated that no branch of industry is more subject to flux, to fresh thought and new knowledge, than the fabrication of compounded road carpets. Under such conditions, specifications must be used with intelligence.

Chemical Society

Birmingham : Decomposition of Molecules by Light

THE decomposition of molecules by light was the subject of a lecture which Dr. R. G. W. Norrish, of the University Chemical Laboratory, Cambridge, delivered before the Chemical Society, at Birmingham, on December 9. In the first place he dealt with the spectroscopic principles underlying molecular decomposition, with special reference to "optical" and "predissociation" processes in the case of simple molecules. He indicated how in such cases, *e.g.*, with NO_2 fluorescence is alternative to photochemical decomposition by the predissociation process. These ideas were exemplified by demonstration experiments with NO_2, in which it was shown that with blue light ($436\mu\mu$) there is fluorescence and no decomposition, while with ultraviolet light ($365\mu\mu$) there is decomposition and no fluorescence.

In addition, Dr. Norrish made reference to the extension of the spectroscopic principles found for diatomic molecules to polyatomic molecules. From a study of the photochemical decomposition products and quantum efficiencies in the case of aldehydes and ketones unexpected results were obtained, which show that these conceptions require considerable modification in the case of polyatomic molecules. In particular it seems possible for large amounts of energy to be transferred from the chromophonic group by which it is first absorbed to some other point on the molecule where reaction may take place. The mechanism of this transfer, however, is not yet clear.

For a full account of the subject matter of this lecture readers are referred to Dr. Norrish's paper which was published in "Acta Physicochimica U.R.S.S.," 1935, *3*, 171.

Liverpool Section : Anthocyanins in Plants

AN interesting lecture on the "Formation of Anthocyanins in Plants" was given before members of the Liverpool Section of the Chemical Society and associated societies at Liverpool University on December 10, Professor Robert Robertson being the lecturer.

After dealing briefly with the physiological characteristics of plants, Professor Robertson pointed out that green leaf was usually free from anthocyanins. The formation of anthocyanins was generally due to the sugars, glucosides, etc., in the plant. Relating some experiments on vines, he said that if they were ligatured the colour did not develop; if they grafted the purple fruit of a vine on to a plant, even although the fruit did not continue growing, the colouring would continue in subsequent fruit. The material necessary

for the production of anthocyanins was produced in the leaf and formation of anthocyanins occurred where there was considerable nutriment to the plant.

Light was necessary for the production of the anthocyanins; another necessity was oxygen. It would appear that oxidation was most important, and they got more "artificial" anthocyanin in the presence of oxygen and light than they did in the dark. The elementary facts of anthocyanin production seemed to show that it was due to the presence of sugar and oxygen.

Using a number of lantern slides, Professor Robertson described the constitution of various anthocyanins and remarked that what he called the "B nucleus" had the same orientation as the C_6C_{16} groups. Discussing the genetics of the dahlia, he said that they had four anthocyanins and two flavones. It had been discovered that you could only have a certain amount of yellow in the yellow dahlia and could not go beyond that limit. From 30 grams of quercetin, he had obtained 0.6 grams of cyanidin, as compared with 0.16 gram previously obtained.

The Institute of Fuel

The Dedusting of Coal

THE dedusting of coal was the subject of a paper presented to the members of the Institute of Fuel in the Lecture Theatre of the Chemical Society, Burlington House, Piccadilly, W.1, on January 8, by Mr. G. Lindley. In earlier days, when coal was hewn by hand and filled directly into tubs in the face, said Mr. Lindley, it was possible for the miner to sort out the portions of the seam which contained shale or inferior coal with little difficulty and to discard these to the goaf or to load them up separately as desired. With the advent of mechanical coal cutting and conveying, the possibility of effecting a discrimination in quality at the coal face became difficult, if not impossible. This was especially so, since the methods of organisation and payment of the personnel were, of necessity, considerably altered. These factors had their influence in tending to cause the coal sent out from the face to contain considerable quantities of dirt, especially so in the smaller sizes. The increasing amount of small dirt and shale to be washed out of the coal caused increasing difficulty in effecting the separation during the washing process as the water tended to take up into suspension the finer coal and dirt particles, especialy the clayey matter, and thus cause changes in the density of the washing water. Endeavour was made to overcome this fouling up of the water by passing the raw coal to the washer over fine mesh screens, either fixed or vibrating, to remove the dust. This dust was then either added back to the small coal after washing or utilised in some other manner, such as boiler firing.

This method of dust extraction had its limitations, for, if the free moisture exceeded 2 per cent., the screen cloth tended to blind up, with consequent reduction in efficiency of dust removal. Compromise was made by fitting larger mesh screen cloths and removing a coarser dust than was necessary for the washing process.

Attention was then turned to the possibility of extracting the dust from the raw coal by pneumatic means. Dedusting plants of various types had been devised in the past for purposes other than coal treatment, and some of these were adapted and modified to deal with coal. Other types were designed originally for the treatment of coal. With the development of coal cleaning by processes using heavy liquids, such as the Chance process (with sand and water); the Lessing process (with calcium chloride) and the de Vooys process (with a clay-barytes suspension), the need for a dust-free raw coal became more or less imperative as the inclusion of the dust in the raw coal would so impair the treatment as to make the process either inoperative or too costly owing to loss of medium.

The extraction of dust by pneumatic methods depends upon the fact that a particle of dust can be suspended in an upward-flowing air current. The size of particle which can be suspended depends upon its shape and density and upon the velocity of the air. Further, when dust particles are being extracted from a mass which contains a considerable proportion of material above dust size, there is considerable obstruction to the disentanglement of the dust particles from the remaining material.

Duffield Coal Products

Motor Spirit from Coal

THE seventh annual ordinary general meeting of Duffield Coal Products, Ltd., was held on December 30 at Winchester House, Old Broad Street, London. Mr. F. Lindley Duffield, chairman and managing director, said that the directors were able to report the completion of the erection of the main unit of the commercial-size plant for the production of water gas of requisite analysis by continuous process for conversion into motor spirit (methanol). The plant had been designed on the lines of full-scale commercial practice, embodying all the essential features of the initial plant on which successful trials had been conducted. What they were seeking and theoretically developing in 1931 had to-day resolved itself into a definite process from which there would be neither gas (as such) nor smokeless coal as by-products with which to contend. Instead of a possible 7 or 10 gal. of motor spirit per ton of coal used, according to research and general trials, there would be 140 gal. of motor spirit per ton of coal used. Actually, 246 gal. of the spirit were obtainable from a ton of coal processed with its requisite water, but additional coal had to be used for heating purposes, thus making 140 gal. per ton of coal used.

Production of Alcohol Fuel

Developments in South Africa

EFFORTS are to be launched by South African manufacturers to encourage the Government to open factories for the large-scale production of alcohol fuel. This is a result of the erection of a torbanite-petrol plant at Ermelo and on the Rand. Durban interests are behind the scheme. It is estimated that at least 10,000,000 gal. of alcohol petrol could be produced annually. Since the Great War a number of Natal industries have produced modest quantities of cane-spirit, with the annual output now nearly 1,000,000 gal. A group of sugar millers are contemplating a tenfold increase following large extensions of their South Coast distilleries. It is hoped that the Government will give them the same protection as that accorded the torbanite industry. The chief raw material of the refiners is molasses, most of which was once imported, but this market has largely been lost. With the provision of bulk storage at Johannesburg for such petrol and the construction of tank cars made to resist the chemical effects of the spirit, production should begin shortly. Mixing stations have been instituted on the Rand. The Natal sugar millers proposed that the Government should legalise the compulsory addition of a quota of South African industrial alcohol to all petrol imported. They state that this is done extensively in Europe. A ten per cent. ratio would be sufficient to absorb some ten million gallons of alcohol. It is stated that an agreement has been entered into between the South African Torbanite Mining and Refining Co., Ltd., and the South African Motor Traders' Association whereby the latter will take over the whole output of the new torbanite petrol and distribute it to the garages and filling stations on the Rand and in Pretoria. This will be the first time South African petrol produced from indigenous mineral sources will be put on the market. To begin with the production of torbanite petrol will only be 6,000,000 gal. a year. It will be known as "Satmar" and for some time will not be sold outside the Transvaal. The price will be twopence per gal. less than that of the imported brands.

Personal Notes

MR. WILSON CROSS was entertained to dinner at the Savoy Hotel on Wednesday evening on the occasion of his retirement from the chairmanship of the Vacuum Oil Co., Ltd., which takes effect on January 31 after forty years' service. Born and educated at Cincinnati, Mr. Cross has been associated with the oil industry throughout his career, except during the Spanish-American war in 1898, when he served as a lieutenant in the artillery. He came to Liverpool in 1902 with the Pennsylvania Lubricating Co., which was absorbed in 1906 by the Vacuum Oil Co., Ltd., and became a director in 1913. In 1919 he was appointed managing director and deputy chairman, and became chairman in 1933. In 1932 Mr. Cross was appointed a director of the Iraq Petroleum Co. and of Mediterranean Pipe Lines. In 1924 he was appointed chairman of the British-American Laundry Machinery Co., Ltd. (afterwards the British Laundry Machinery Co., Ltd.), and he still occupies that position. Mr. Cross helped to form the American Chamber of Commerce in London in 1917 and became vice-president in the same year. From 1921 until 1925 he was chairman of the American Society in London, and he has been president of the American Club since 1923.

Anglo-American News

Mr. Wilson Cross.

MR. A. G. I. ANDERSON has been appointed general manager of the Shotley Bridge and Consett District Gas Co.

MR. P. A. OXLEY, steel manufacturer, of Rotherham, left £18,021, with net personalty £17,930.

MR. N. E. L. MCEACHRAN, of Lanarkshire, retired asbestos manufacturer, left personal estate to the value of £32,752.

MR. R. WATERSTON, ironmaster, of Helensburgh, director of the Scottish Iron and Steel Corporation, Ltd., left personal estate in Great Britain to the value of £30,763.

SIR JAMES IRVINE, F.R.S., will be elected president of the Lancastrian Frankland Society at Lancaster on January 17, in succession to Professor H. E. Armstrong.

PROFESSOR VICTOR GRIGNARD, professor of general chemistry in the University of Lyons, and an honorary fellow of the Chemical Society, died on December 13, aged sixty-four years.

LORD MELCHETT, a director of Imperial Chemical Industries, International Nickel Co., of Canada, and other companies, spoke on "The no par value share and its effect on company finance," at a luncheon of the London members of the Institute of Chartered Accountants on January 9.

MR. P. MAITLAND, of Jesus College, Cambridge, has been appointed University demonstrator in the Department of Chemistry for three years, and MR. B. C. SAUNDERS (Magdalene College) University demonstrator in the Department of Chemistry for three years. In the first case the appointment commenced on October 1, 1935. In the second it will commence as from October 1 next.

MR. D. M. STRATH, a director of Ogston and Tennant, Ltd., soap makers, Renfrew, since 1918, has retired. He thus ends a personal connection with the soap trade which lasted 44 years and a family connection which began as long ago as 1835, when Mr. Strath's father joined the firm of A. Ogston and Sons. Mr. Strath had a useful two years' business probation in the United States before starting his career with Ogstons in 1891. In 1914 he went to Renfrew from Aberdeen to take charge of the commercial side of the business and for 21 years his business activities have been largely centred there.

MR. J. L. CHARLES, A.M.I.C.E., has joined the Dyestuffs Group of Imperial Chemical Industries.

MR. W. HODGSON, of Cheshire, oil broker, left £32,100, with net personalty £30,101.

MR. H. J. MITCHELL has been elected president of Imperial Chemical Industries, Ltd. in succession to the late Marquess of Reading.

MR. ANDREW GRAY, general manager of the Lanarkshire Steel Co., Ltd., resigned on December 31 for health reasons. He will continue to act as a director of the company.

MR. E. T. STILLER, B.SC., PH.D., has left Imperial Chemical Industries to take up an appointment at the National Institute of Medical Research.

MR. H. E. BAGGS, of Sheffield, joint managing director of Thomas Andrews and Co., Ltd., steel works, left £3,863, with net personalty £2,721.

DR. G. P. LISHMAN has retired from the managership of the coke oven, by-products plant and coal washery at New Lambton, Co. Durham, and has been presented with a gold watch, a case of pipes and a gold brooch for his wife. The presentation was made by Mr. J. Horner, under manager. Mr. J. Gordon, an official at the works, has been appointed to succeed Dr. Lishman.

MR. ALEXANDER LOWE MCCOLL, deputy chairman and joint managing director of the Vacuum Oil Co., Ltd., since 1933, has been appointed chairman of the board of directors on the retirement of Mr. Wilson Cross. Mr. Hubert Holliday, formerly joint managing director, is now managing director. A native of Kilmarnock, Mr. McColl joined the company in 1905 in a junior capacity, and 14 years later was elected to a seat on the board. He is a well-known figure in industrial, marine and railway circles; a director of the Superheater Co., Ltd., and Indestructible Paint Co., Ltd., president of the MacColl Society, and a past president of the London Ayrshire Society.

Mr. A. L. McColl.

South American Chemical News

Cuba

BY A RECENT DECREE IT IS FORBIDDEN to incorporate alum or any other aluminium compounds with food products.

Brazil

GOVERNMENT MEASURES ARE ANNOUNCED for developing the carnauba wax industry. At Carnaubas, in the State of Rio Grande, prizes are being awarded for the best yields, while the State of Ceara has prohibited the export of carnauba tree seed. The Brazilian Government is awarding prizes to a total value of 50,000 milreis for improved processes for mechanical extraction of carnauba wax.

Argentine

TO AVOID LABOUR DIFFICULTIES in the United States, the St. Louis Smelting and Refining Co. (a subsidiary of the National Lead Co.) is understood to be planning removal of its activities to the Argentine where employment would be found for 100 workers.

THE USE OF BORIC ACID for preservation of certain foodstuffs was permissible in the past but has now been prohibited.

The Importance of Advertising

Sir Ernest Benn and the 30-50 Theory

SIR ERNEST BENN, in his capacity as president of the Advertising Association, was the guest of the Leicester Publicity Club at luncheon on January 3. In an address, Sir Ernest Benn said that during his presidency he hoped to be able to do something to widen the scope of the advertising idea—to explain to themselves and the public the breadth, depth and importance of advertising as applied to the economic and industrial position generally. Advertising to him was not simply a six-inch double column, or some poster, or piece of printing. The advertising man, if he was true to his position and responsibilities, was the eyes and brains of the commercial world, and had to study it in a broad and deep way, such as was not necessary to the manufacturer or the occupier of some sectional position.

In a general survey, Sir Ernest Benn said "The world has been in a mess since 1914, and I explain these sufferings by the 30-50 theory. The weight, the power, the push and go in any society at any time is mostly carried by the men in the vigorous age between the ages of 30 and 50. The shambles of 1914-1918 wiped out a complete generation, and have, in fact, robbed us ever since of the proper proportion of 30-50 men. The world has been carrying on with poor old fossils like me, extreme youths full of knowledge and lacking all experience, and an undue proportion of women.

"The boy who just escaped the war is coming into full maturity and taking his full responsibility. That supply is increasing day by day, and year by year, and things are bound to get better."

Glue Testing

New British Standard Specification

THE British Standards Institution has issued a series of standard methods for the testing of bone, skin and fish glues (British Standard Specification 647, of 1935, 3s. 8d. post free). These methods which have been prepared by a representative technical committee under the chairmanship of Mr. R. Duncalfe have been developed by the Federation of Hide Gelatine and Glue Manufacturers, Ltd., and the Federation of Bone Users and Allied Trades, Ltd., and represent the experience of the glue industry over many years.

The tests laid down include methods for the determination of moisture content, jelly strength, viscosity, melting point, foam, water absorption, keeping quality, joint strength in shear, reaction, grease, ash, sulphur dioxide, and chlorides. The details of the tests adopted have been arrived at after careful examination of existing methods of analysis, particularly from the standpoint of accuracy and reliability, and in many cases experimental work has been carried out by members of the committee in practical verification of the methods.

The foreword to the Specification makes it clear that the relative importance of the tests described must necessarily depend largely on the purposes for which the glue is intended. The joinery trade is particularly interested in strength and spread, the gummed paper manufacturer in tackiness and foam, etc. It will therefore be seen that it is not necessary for any one particular trade to utilise all the tests laid down, it being usual in practice for the consumer to find by experience the most suitable type of glue for his purpose and then to check future deliveries in respect of those properties in which he is interested and which are relevant to the purpose for which the glue is intended.

Apart from the industry itself, these methods of test should prove particularly interesting to all those concerned with the examination of glues, both in the laboratory and in the workshop. The specification will fulfil a long-felt need and will provide a means whereby samples submitted from different sources can be tested under accurately defined and corresponding conditions of procedure and test.

Continental Chemical Notes

Jugoslavia

THE JUGOSVILA SILK FACTORY, at Melje, has decided to run its own dyeing and finishing works which is expected to commence operation this spring.

Belgium

NEW COMPANY FORMATIONS include "Huiles et Dérivés" in Brussels (manufacture of products derived from mineral oils), and the "Chemica" concern in Turnhout with a capital of 300,000 francs (general chemical trading).

France

THE RAFFINERIES DE SOUFRE REUNIES have acquired control of the Raffinerie Internationale de Soufre and the Union Sulphur Company d'Alger. The last-named company has been badly hit by the depression in viticulture and the new merger should put an end to the ruinous price-cutting tactics of the individual companies.

Iceland

LEGISLATION HAS BEEN DRAFTED in connection with erection of a nitrogen products factory to be built in conjunction with the power works at the Zog Falls already under construction. The annual capacity of the plant (which has been designed by a Dutch-American firm) comprises 35,000 sacks of calcium-ammonium nitrate and 15,000 sacks of nitrophoska, these quantities sufficing to meet the yearly domestic requirements during the next few years.

Russia

IMPORTANT TUNGSTEN DEPOSITS are reported to have been discovered at Dshidin in the Burjato-Mongolian Republic.

PROMISING RESULTS HAVE FOLLOWED re-investigation of the process for purifying anthracene with liquid ammonia proposed some years ago by Wilton. On treating crude anthracene (30 to 40 per cent. purity) with liquid ammonia at the ordinary temperature and under a pressure of 8 or 9 atmospheres, the anthracene remaining after filtration and washing was 86 per cent. pure, the ammonia having dissolved out phenols, phenanthrene and carbazole ("Industrie Chimique," December, 1935, 948).

Germany

BY A DECREE OF THE STATE ALCOHOL MONOPOLY, alcohol motor fuels on sale from January 1, 1936, must comprise 9 parts absolute alcohol and 1 part methyl alcohol.

THE MANUFACTURE OF POTATO STARCH by a new process ("Chemische Fabrik," December 31, 1935) is claimed to facilitate continuous, rapid and complete separation of pulp and tissue from the starch. Patents have been applied for.

THE DISCOVERY OF TRIPHENYLENE in the chrysene fraction of bituminous coal tar is reported by A. Kaffer. The new substance crystallises from alcohol in colourless needles melting at 96.5° C. and is present to the extent of 1 to 3 per cent. in the crude chrysene fraction ("Berichte," 1935, *68*, 1,812).

Accelerated Slaking of Lime

A RUSSIAN investigator has found that if a 5 per cent. solution of sodium chloride is substituted for pure water in slaking lime the rate of slaking is doubled. This finding was discussed in an article in the "Journal of Chemical Industries (Moscow)," 1934, No. 12, 43-5, which was summarised in "Chemical Abstracts," 1935, *29*, 2,312. Possibly the slow slaking of magnesium limes could be accelerated advantageously by this method.

From Week to Week

AN INDEX to Volume XXXIII of THE CHEMICAL AGE (July to December, 1935) is published with this issue. It will be found inside the back cover, whence it can reaily be detached for binding purposes.

A PRINTER'S ERROR occurs in the telegraphic address of W. H. Pease and Co., Ltd., in their advertisement in page 73 of THE CHEMICAL AGE Year Book. This should read "Engipease, London."

COMMERCIAL SOLVENTS (GREAT BRITAIN), LTD., Aldwych House, Aldwych, W.C.2, have increased their nominal capital by the addition of £50,000, in £1 shares, beyond the registered capital of £200,000.

TORQUAY CORPORATION invites tenders for the supply, during the 12 months beginning April 1 next, of safety fuse and explosives, disinfectant, Portland cement, etc. Tenders have to be in not later than February 3.

DURING NOVEMBER the Irish Free State purchased chemicals, drugs and similar products to the value of £83,987, as compared with £77,067 in the corresponding period of 1934. Imports of chemical fertilisers totalled £27,166, as against £32,393 in November, 1934.

BRITISH AND COLONIAL BAUXITE CO., LTD., Adelaide House, King William Street, E.C.4, has increased its nominal capital by the addition of £15,000, in £1 "A" shares, beyond the registered capital of £20,000. This public company was registered on November 26, 1926. To December 21, 1934, 15,000 "A" and 5,000 "B" shares had been issued and fully paid up. The shareholders at that date included Alumina Co., Ltd. (1,232 "A"); Aluminium Corporation, Ltd.) (2,562 "A"); British Aluminium Co., Ltd. (6,988 "A" and 5,000 "B"); R. & J. Garroway, Ltd. (1,399 "A"); and Peter Spence and Sons, Ltd. (1,897 "A").

THIRTY-THREE FILLING STATIONS have set up pumps supplying motorists with petrol made by low temperature carbonisation from British coal since Mr. Tom Williams, M.P. for the Don Valley, opened the first of them at the garage of Brew Brothers in the Old Brompton Road last month. Eight of the new pumps are in London, seven are in Sussex, four in Kent, four in Herts., three in Surrey, two in Essex and others in Bedfordshire, Gloucestershire, Hampshire, Middlesex, and Somerset. Sites for a further twenty-two are in prospect. Each pump carries a globe shaped like a sack of coal.

THE LATEST EDITION of an interesting catalogue, entitled "Chemicals by Glyco," has just been published. Several new products which were on display at the recent United States chemical exposition are fully described. Amongst these might be mentioned diglycol laurate, abopon, proofit, a one bath waterproofing agent, and lohrinol, a wetting agent especially suitable in acids and hard water. A welcome addition to the chemical and physical tables has been the inclusion of *p*H tables of the most common acids and bases. The Glyco Products Co., Inc., 949 Broadway, New York City, will be glad to send a copy to any executive, chemist or technical worker, on request.

THE PAST YEAR has been a satisfactory one in some sections of the British chemical industry and unsatisfactory in others. The annual report adopted by the Chemical and Alied Trades Section of the Manchester Chamber of Commerce on January 3 points out that the Safeguarding of Industries Act is to expire in August and that the question will arise as to whether the duties which it imposes are to be continued by a renewal of the Act substantially in its present form or, alternatively, be brought under the control of the Import Duties Advisory Committee under the provisions of the Import Duties Act, 1932. If there were a general consensus of opinion among the members as to the course that would best serve the interests of the trades represented in the section, suitable representations could be made to appropriate authorities. Mr. Forrest Hewit, who presided at the meeting, was re-elected chairman of the section.

THE FRENCH REVIEW, "L'Entreprise Française" has published a special number containing full particulars of the building and public works laboratories, 12 Rue Brancion, Paris, which were inaugurated in June, 1935, by M. Edouard Herriott, president of the French Association for the Development of Technical Education, accompanied by M. Luc, General Director of Technical Education. This special number of 284 pages, with 32 plates, is meant to show to scientists, professors, public services, surveyors, experts, engineers, architects, contractors, manufacturers, etc., directly or indirectly interested in the mechanical strength of building materials, in their composition, and in their physical and chemical qualities, the powerful, precise and modern means of investigation which laboratories place at their disposal. Utilisation tables are designed to show which tests are most adapted to the research or control desired. There are a certain number of subdivisions which correspond to a class of materials and successive divisions in each class will bring from the general case to the particular one and lastly to the own number of the test. A catalogue of tests is divided into divisions corresponding to a class of materials exactly as the above tables.

THE TELEPHONE NUMBER of the Birmingham office of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, has been changed to Midland 0784-5.

FUMIGATORS SUPPLIES, LTD. (originally Fumigators Chemicals Ltd.), of 232 Salisbury House, E.C., have changed their name to Metallurgical and Chemical Supplies, Ltd.

IMPORTS OF POTASH to Holland during the first six months of the three years 1933, 1934, and 1935 were 11,000 tons, 61,000 tons, and 39,000 tons respectively. Imports for 1935 up to the end of September reached the record figure of about 93,000 tons.

THE VICE-CHANCELLOR of Cambridge University, Mr. G. H. A. Wilson, Master of Clare College, has announced that the Rockfeller Foundation has agreed to make a grant of not more than £1,200 a year for five years, from January 1, for research in cellular physiology at the Malteno Institute, under the direction of Professor Keilin.

EVERY SUBSCRIBER on our books at the time of the publication of THE CHEMICAL AGE Year Book receives a free copy of the Year Book. We still have a few copies of the 1936 edition available for any new subscribers commencing from the beginning of this year, but early application is advisable as the supply is strictly limited.

THE WORLD'S GREATEST OIL PRODUCTION ever recorded for one month has been reported by the League of Nations' monthly bulletin of statistics. In October, 1935, the bulletin says, the total world production of petroleum amounted to 19,362,000 metric tons, compared with 17,807,000 metric tons in October, 1934. The most noteworthy increase in the last twelve months was in the United States. In October the production there amounted to 12,087,000 metric tons, compared with 10,501,000 metric tons a year before.

THE PUBLICATION of the "Minerals Yearbook, 1935," is announced by the United States Bureau of Mines. The volume, containing 75 chapters, 129 illustrations, and nearly 1,300 pages, constitutes a condensed library of current developments in the mineral industries. It chronicles the production of a hundred commercial minerals in the United States and abroad during the year 1934. Technical progress in the production of these minerals and their present economic position are reviewed. Chapters on miscellaneous commercial gases and on minor non-metallic minerals appear for the first time. The series of "Minerals Yearbooks" presents the current annual record of the various mineral industries against a background adequate for perspective in the interpretation of current trends.

IMPORTS OF CHEMICAL AND ALLIED PRODUCTS into Brazil during the first nine months of 1935 amounted to 53,525 tons, valued at £1,065,000, according to a special statistical compilation made from official Brazilian statisties. September imports were considerably smaller than either of the two preceding months. These figures include only industrial chemicals, medicinal preparations, and chemical fertilisers. Leading items imported for the first nine months were: Quinine and other alkaloids and salts thereof, 17,500 kilos, valued at £44,100; medicinal preparations, £326,600 kilos, £400,000; vaccines and serums, £8,800; petroleum jelly, 445,500 kilos, £8,400; chemical fertilisers, 14,562 tons, £52,400; caustic soda, 18,000 tons, £175,500; sodium sulphate, 2,000 tons, £3,600; copper sulphate, 1,375 tons, £15,200; and potassium and sodium chlorate, 700 tons, £17,700.

CAPTAIN HILTON, the managing director, announces that the United Steel Co., Ltd., will sink in the near future two pits at Workington to win coal from a large undersea coalfield estimated to contain 125,000,000 tons of coal. It is in this coalfield that there lies the Main Band seam, which is also worked by the Whitehaven Collieries. The new enterprise of the United Steel Co. is part of a long-term plan for modernising and making self-contained its West Cumberland unit at Workington. The largest furnace in the kingdom, with a weekly output of 3,000 tons of hematite pig iron, was built three years ago. A new Bessemer plant was laid down two years ago, and now there is in course of erection a battery of fifty coke ovens of the latest type, which will be in operation by the middle of this year. Another fifty ovens are to be erected, and it remains only for the coal to be raised on the spot.

THE IRON AND STEEL INDUSTRIAL RESEARCH COUNCIL in co-operation with the Buiding Research Station has been investigating the possibilities of extending the use of blast furnace slag as a concrete aggregate. The council is investigating the factors governing the life of ingot moulds and the effect of some of these on steel quality. The Non-Ferrous Metals Research Association, in consultation with the industry, has evolved a new five-year plan of research. The new research programme covers 50 subjects, work on nine of which is to be started immediately, including investigations on the moulding and casting of bronze, the casting of nickel silver and methods for improving the surface finish of rolled brass. The Cast Iron Research Association is making good progress with the processes it is developing for improving the strength of cast irons. Important investigations are in progress at the National Physical Laboratory on the development of light magnesium alloys of good mechanical properties.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

CONDITIONS have remained quiet in the general chemical market during the week and there are no price changes to report. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—There has been a broadening in the demand for general chemical products since the resumption of business from the new year holidays and prices continue steady with the undertone strong. There are no changes of importance to record in prices since the last revision.

MANCHESTER.—On the whole, business in chemical products on the Manchester market during the past week seems to be almost back to normal, the market having registered a satisfactory recovery from the holiday influences. Additional contract booking this week has not been important, but there has been a moderate flow of orders for near delivery positions. A satisfactory feature is that deliveries into consumption are now back pretty well to where they were before the interruptions due to the holidays and stocktaking operations, and there has been a steady flow of specifications for the leading heavy products. The price position, generally, is steady, with, in the case of the tar products, a firm feeling in most sections and a continued upward tendency of values.

SCOTLAND.—Business in chemicals has again been very quiet during the week, both for home trade and export, on account of the holidays. Prices, however, continue very steady at about previous figures with no changes of importance to report.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—LONDON: Tech., 80%, £33 5s. to £35 5s. per ton; pure 80%, £35 5s. to £37 5s.; tech., 40%, £17 16s. to £19 15s.; tech., 60%, £25 15s. to £27 15s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £37 5s.; tech. glacial, £50.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11½d. per lb. MANCHESTER: 11¾d. to 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d., less 5%. SCOTLAND: 1s. 0½d. less 5%. MANCHESTER: 1s. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—4s. 10d. to 5s. 1d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4¼d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £42 10s.

LITHOPONE.—30%, £16 10s. to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7¼d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 10s. SCOTLAND: £20 15s.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON:

4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3¾d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5¼d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5¼d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £14 17s. 6d. to £16 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINZ SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Coal Tar Products

ACID, CRESYLIC.—90/100%, 2s. to 2s. 8d. per gal., according to specification; pale 98%, 1s. 10d. to 1s. 11d.; dark, 1s. 6d. to 1s. 7d. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2¾d. per gal. MANCHESTER: Crystals, 7¼d. to 7¾d. per lb.; crude, 2s. 7d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 9d.; 90%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £12 15s. per ton; purified crystals, £15 5s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 2s. 3d. to 2s. 4d. per gal.; pure, 2s. 6d. to 2s. 7d.

XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 4d.

PITCH.—Medium, soft, 35s. to 36s. per ton, in bulk at makers' works.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The prices have been announced for the remainder of the fertiliser year 1935/36 as follows: January, £7 2s. per ton; February, £7 3s. 6d.; March to June, £7 5s., for neltral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: January £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April/June, £7 5s., delivered in 4-ton lots.

NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an *—followed by the date of the Summary, but such total may have been reduced.)

I.C.I. (FERTILIZER AND SYNTHETIC PRODUCTS), LTD. (late Synthetic Ammonia and Nitrates, Ltd.), London, S.W. (M., 11/1/36.) Reg. Dec. 20, £1,244,900 charge, to Midland Bank, Ltd.; general charge. *£1,370,200. Apr. 19, 1935.

SPLINTEX SAFETY GLASS, LTD., London, E.C. (M., 11/1/36.) Reg. Dec. 30, £5,000 deb., to H. Aron, Beverley Works, Barnes; general charge. *Nil. Nov. 11, 1935.

Satisfactions

H. EDWIN COLEY, LTD., London, E.C., mineralogists, etc. (M.S., 11/1/36.) Satisfaction reg. Dec. 24, of deb. reg. Feb. 28, 1933, to extent of £1,500.

I.C.I. (FERTILIZER AND SYNTHETIC PRODUCTS), LTD. (late Synthetic Ammonia and Nitrates, Ltd.), London, S.W. (M.S., 11/1/36.) Satisfaction reg. Dec. 23, of Trust Deed reg. July 6, 1925.

New Companies Registered

Central Tar Distillers, Ltd., 6 Bennets Hill, Birmingham.—Registered December 12. Nominal capital £100. Tar distillers, by-product and coke manufacturers, patent fuel manufacturers, oil producers. A subscriber: Henry C. Chambers.

Drefach Jubilee Colliery Co., Ltd., 45-47 Holton Road, Barry, Glamorgan.—Registered December 24. Nominal capital £6,000. Colliery proprietors, mine and quarry owners, patent fuel, briquette and coke manufacturers, manufacturers of and dealers in sulphate of ammonia, benzol, pitch, tar, breeze, creosote, slack, naphtha, naphthalene and asphaltum, ammonia and ammoniacal liquor, etc. Directors: W. Richards, Idris Thomas, G. Warren.

Katalik, Ltd., Dashwood House, Old Broad Street, W.C.2.—Registered December 27. Nominal capital £5,000. Distillers, extractors, producers, manufacturers and suppliers of all solid, liquid and gaseous substances from coal and bituminous substances, etc. Directors: G. R. Davies, R. J. Langham, F. B. Scott Murray.

E. and D. H. Richards, Ltd., Eden Holme, Oswestry.—Registered December 23. Nominal capital £2,500. To acquire the business of a fertiliser manufacturer carried on by W. Davies at Rednal, near Oswestry, Salop, as "E. and D. H. Richards," and to carry on the business of seed crushers, dealers in all kinds of grain, seeds, meal and millers' offal, manufacturers of disinfectants, super phosphate, chemical and bone manures, etc. Directors: W. Davies, W. H. Gittins, J. R. Mackavoy.

Squire A. Radcliffe & Sons, Ltd., 49 Bennett Lane, Dewsbury.—Registered December 19. Nominal capital £7,000. Oil extractors and merchants, chemical manufacturers, manure manufacturers, shoddy manufacturers and waste dealers, etc. A subscriber: J. E. Radcliffe.

Swanson's Products, Ltd., 227 Ellor Street, Pendleton, Salford.—Registered December 14. Nominal capital £1,000. To acquire the business of a chemical manufacturer carried on by Robert Nixon, at 227 Ellor Street, Salford, Lancs., as "Swanson's Products," and to carry on the same and the business of manufacturers, refiners and preparers of and dealers in all kinds of oils and oleaginous and saponaceous substances, etc. Directors: Robert W. Fry, Robert Nixon.

Chemical and Allied Stocks and Shares

Broadening of Interest in Most Sections

THE new Stock Exchange account which commenced on Monday has shown increased business in industrial shares and, with few exceptions, price movements have been in favour of holders on balance for the week. Among shares of companies identified with the chemical and allied trades a broadening of interest was in evidence and numerous individual features developed. Unilever were prominent with a sharp advance, due largely to the increase in the price of margarine. The market realises that this cannot have benefited the 1935 profits to any extent, but it improves the outlook for the current year. Imperial Chemical have been steady. Although the conversion of the deferred shares into ordinary would mean a larger amount would have to be distributed in dividends if the payment on the ordinary shares were maintained at 8 per cent., the general belief is that the latter rate will again be forthcoming for the year. British Oxygen have advanced substantially on the week. In this case demand is due to the belief that the bonus foreshadowed in celebration of the company's fiftieth anniversary is likely to be announced in April, and that it may take the form of two shares for every five held. Imperial Smelting were active, there being anticipations that the shares have reasonably good prospects of re-entering the dividend list this year, provided the price of zinc keeps at a favourable level. There was again active demand for United Molasses, it being pointed out that over the next few years the company's profits may approach the £1,000,000 level shown prior to the depression, in which case earnings on the ordinary shares would be at a very high rate, bearing in mind that the amount in issue has been reduced by the capital reorganisation. British Glues recovered to 8s. 1½d. and Fison, Packard & Prentice were again active although unchanged at 45s. Cooper, McDougall and Robertson changed hands more freely. Salt Union were done at higher prices. The list price has remained at 42s. 6d.—45s. giving a "middle" price of 43s. 9d., but it would appear to be in need of adjustment as many markings of business have appeared around 46s. 6d. Gas Light and Coke issues have not been affected by the higher coal prices. Distillers moved up, partly on the success of motor spirit suggested by the higher profits of the concern which distributes the latter. Declaration of Distillers' interim dividend is imminent, but the market is continuing to take the view that all question of an increase is likely to be left until the final payment. British Drug Houses were more active with business around 18s. 3d. For each of the past three years the dividend has been 5 per cent. and the shares give an apparently favourable yield. On the last occasion 8 per cent. could have been paid if a further £10,000 had not been placed to reserve. Triplex Safety Glass were prominently active, largely owing to the possibility of at least $250,000 accruing to the company from the Triplex Safety Glass Co. of North America. This possibility has increased the view in the market that as time proceeds there may be some form of bonus for Triplex Safety Glass shareholders. Courtaulds have moved up, partly owing to growing hopes that a larger dividend for the year may be announced next month. British Celanese issues were also better in response to expectations of a further payment in respect of preference dividend arrears being announced this month. Bradford Dyers issues were firmer.

Name.	Jan. 7.	Dec. 31.
Anglo-Iranian Oil Co., Ltd. Ord.	70/-	68/9
,, 8% Cum. Pref.	36/6	36/-
,, 9% Cum. Pref.	37/6	37/-
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	2/6
,, 6½% Cum. Pref.	5/6¾	5/6¾
Associated Portland Cement Manufacturers, Ltd. Ord.	68/-	65/-
,, 5½% Cum. Pref.	28/-	28/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	66/3	66/3
Bleachers' Association, Ltd. Ord.	7/6	7/6
,, 5½% Cum. Pref.	10/7½	10/7½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	50/-	49/6
Borax Consolidated, Ltd. Pfd. Ord. (£)	105/-	104/-
,, Defd. Ord.	21/3	21/3
,, 5¼% Cum. Pref. (£10)	£11/12/6	£11/10/-
,, 4½% Deb. (1st Mort.) Red. (£100)	£107	£107
,, 4½% 2nd Mort. Deb. Red. (£100)	£102/10/-	£102/10/-
Bradford Dyers' Association, Ltd. Ord.	10/-	10/-
,, 5% Cum. Pref.	13/1½	13/1½
,, 4% 1st Mort. Perp. Deb. (£100)	£87	£87
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/6	25/6
,, 7½% Part. 2nd Cum. Pref.	23/6	23/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/3	6/3
,, 4% 1st Mort. Deb. Red. (£100)	£94	£94
British Cyanide Co., Ltd. Ord. (2/-)	3/1½	3/1½
British Drug Houses, Ltd. Ord.	17/6	17/6
,, 5% Cum. Pref.	21/10½	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	8/1½	7/6
,, 8% Pref. (Cum. and Part.)	28/9	28/9
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
,, 5½% Cum. Pref.	26/3	26/3
,, 4½% First Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	115/-	111/3
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	85/-	85/-
,, 6% Cum. Pref.	30/6	30/6
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£102/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	112/6	112/6
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	8/9	8/9
,, 5% Pref. (Cum.)	15/7½	15/-
Cellulose Acetate Silk Co., Ltd. Ord.	14/-	12/9½
,, Deferred (1/-)	2/1½	2/1½

Name.	Jan. 7.	Dec. 31.
Consett Iron Co., Ltd. Ord.	11/-	11/3
,, 8% Pref.	30/-	30/-
,, 6% First Deb. stock, Red. (£100)	£107	£107
Cooper, McDougal & Robertson, Ltd. Ord.	38/9	28/9
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	60/-	58/9
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	31/10½	31/10½
,, 7½% "A" Cum. Pref.	32/6	30/7½
Distillers Co., Ltd. Ord.	98/-	97/6
,, 6% Pref. Stock Cum.	31/6	31/6
Dorman Long & Co., Ltd. Ord.	21/3	21/3
,, Pref. Ord.	31/3	30/-
,, 6½% Non-Cum. 1st Pref.	23/-	22/9
,, 8% Non-Cum. 2nd Pref.	24/3	23/6
,, 4% First Mort. Perp. Deb. (£100)	£101/10/-	£101/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£106/11/-	£106/10/-
English Velvet & Cord Dyers' Association, Ltd. Ord.	5/-	5/-
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£72/10/-	£72/10/-
Fison, Packard & Prentice, Ltd. Ord.	45/7½	45/-
,, 7% Non-Cum. Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co. Ord.	27/6	27/6
,, 3½% Maximum Stock (£100)	£89/10/-	£89/10/-
,, 4% Consolidated Pref. Stock (£100)	£108/10/-	£107/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90	£90
,, 5% Deb. Stock Red. (£100)	£116/10/-	£116/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£113/10/-	£112/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	14/4½	14/4½
,, 7% Prefd. Ord. (10/-)	13/9	13/9
,, 7% Cum. Pref.	28/9	28/9
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	37/3	37/-
,, Deferred (10/-)	9/1½	9/1½
,, 7% Cum. Pref.	34/-	34/-
Imperial Smelting Corporation, Ltd. Ord.	15/9	15/-
,, 6½% Pref. (Cum.)	24/3	24/3
International Nickel Co. of Canada, Ltd. Cum.	$45	$46½
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	115/-	115/-

Name.	Jan. 7.	Dec. 31.
Lawes Chemical Co., Ltd. Ord. (1/-)	6/3	6/3
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	32/6	32/3
,, 8% Cum. "A" Pref.	33/9	33/-
,, 20% Cum. Prefd. Ord.	77/6	68/9
,, 5% Cons. Deb. (£100)	£106/10/-	£106/10/-
,, 4% Cons. Deb. (£100)	£105/10/-	£105/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£40	£40
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	42/6	43/-
,, 1st Pref. 6½% Cum.	32/-	32/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£72	£70
Reckitt & Sons, Ltd. Ord.	115/7½	115/7½
,, 4½% Cum. 1st Pref.	24/4½	24/4½
Salt Union, Ltd. Ord.	43/9	43/9
,, Pref.	45/-	45/-
,, 4½% Deb. (£100)	£107/10/-	£107/10/-
South Metropolitan Gas Co. Ord. (£100)	£133/10/-	£133/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£107	£107
,, Perpetual 3% Deb. (£100)	£88/10/-	£88/10/-
,, 5% Red. Deb. 1950-60 (£100)	£114/10/-	£116/10/-
Staveley Coal and Iron Co., Ltd. Ord.	47/6	47/6
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	89/4½	89/4½
Unilevers, Ltd. Ord.	32/6	29/4½
,, 7% Cum. Pref.	30/3	30/3
United Glass Bottle Manufacturers, Ltd. Ord.	42/6	44/-
,, 7½% Cum. Pref.	32/6	32/6
United Molasses Co., Ltd. Ord. (6/8)	22/6	21/3
,, 6% Cum. Pref.	25/-	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	10/9	10/9
,, 7% Cum. Pref.	25/-	25/-
,, 4¾% Deb. Red. (£100)	£101/10/-	£101/10/-

Inventions in the Chemical Industry

Patent Specifications and Applications

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

Destructive hydrogenation of distillable carbonaceous materials, process.—International Hydrogenation Patents Co., Ltd. June 23, 1934. 15473/35.

Dehydrating agents for drying gases, production.—G. F. Jaubert. June 18, 1934. 15790/35.

Oxyarylaminoanthracene derivatives, manufacture.—I. G. Farbenindustrie. June 23, 1934. 16941/35.

Monoazo dyestuffs, manufacture.—I. G. Farbenindustrie. June 20, 1934. 17522/35.

Treatment of unsaturated halides, process.—Naamlooze Vennootschap de Bataafsche Petroleum Maatchappij. June 23, 1934. 17981/35.

Specifications Accepted with Date of Application

Hydroxy compounds of the anthrapyrimidine series, manufacture and production.—Coutts and Co., and F. Johnson. Jan. 31, 1935. 439,944.

Dyestuffs of the anthraquinone series, manufacture and production.—Coutts and Co., and J. Johnson (I. G. Farbenindustrie). June 8, 1934. 439,885.

Fine-grain development of silver halide emulsions.—W. W. Groves (I. G. Farbenindustrie). June 13, 1934. 440;101.

High-molecular true sulphonic acids, manufacture.—W. G. Tennant (Henkel and Cie Ges.). June 15, 1934. 440,103.

Organic esters of cellulose, saponification.—British Celanese, Ltd., R. W. Moncrieff and F. B. Hill. June 16, 1934. 440,034.

Carbon dioxide, plant for production.—Kodigen A.-G. für Komprimierte Gase in Vaduz and D. Burger. June 19, 1934. 439,976.

Oil soluble artificial resins, process for making.—Dr. K. Albert Ges. Chemische Fabriken. June 21, 1933. 440,110.

Azo dyestuffs, manufacture.—A. Carpmael (I. G. Farbenindustrie). June 20, 1934. 440,112.

Soluble salt of 3 : 6-diamino-10-methylacridinium, manufacture.—May and Baker, Ltd., and R. W. E. Stickings. Aug. 23, 1934. 439,902.

Nitrogen or mixtures of nitrogen and hydrogen, apparatus for manufacture and production.—Coutts and Co. and F. Johnson (I. G. Farbenindustrie). Oct. 9, 1934. 440,054.

Refining halogenated hydrocarbons, processes.—British Thomson-Houston Co., Ltd. Oct. 18, 1933. 440,136.

Process and electrolytic cells for the production of alkali metals and alkaline earth metals.—I. J. Moltkehansen. Oct. 31, 1933. 440,139.

Refining selenium, method.—Bolidens Gruvaktiebolag. June 6, 1934. 440,004.

Unsaturated oxy compounds to aldehydes, ketones, or substituted derivatives thereof, conversion.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 23, 1934. 440,154.

Potassium nitrate, production.—Kali-Forschungs-Anstalt G. Nov. 3, 1934. 439,931.

Condensation products from urea, formaldehyde, and hexamethylenetetramine, manufacture.—Soc. of Chemical Industry in Basle. May 29, 1934. 439,932.

Stable solutions of dihydroxy-diamino-arsenobenzene and its derivatives, process for manufacture.—F. Hoffmann-La Roche and Co. A.-G. July 6, 1934. 439,935.

Applications for Patents
(December 12 to 18 inclusive)

Oxygenated compounds derived from butyraldehyde and its derivatives.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 20, '34.) 35069.

Azo dyestuffs, manufacture.—A. Carpmael (I. G. Farbenindustrie). (Aug. 29, '34.) 35022.

Improving potassium soaps, process.—Chemische Fabrik J. A. Benckiser G., and F. Draisbach. (Germany, Oct. 31.). 34591.

Caustic soda, manufacture.—I. L. Clifford and Imperial Chemical Industries, Ltd. 34708.

Conversion of bituminous substances, etc., process.—G. Colmant. (Germany, Dec. 14, '34.) 34866.

Thin sheets from polymerisates, manufacture.—Deutsche Celluloid Fabrik. (Germany, Dec. 15, '34.) 34874.

Yeast, manufacture.—T. R. Dixon. 34491.

Precious metals from photographic baths, recovery.—H. G. Doffin. (France, Dec. 20, '34.) 34630.

Oxidation of ammonia with oxygen, process.—H. D. Elkington (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). 34690.

Phosphates, manufacture.—J. P. Fraser. 34897, 34898.

Separating volatile acids from combination with metallic bases, method.—J. P. Fraser. 34899.

Alkali metal hydroxides, manufacture.—D. Gardner. 34609.

Incorporation of kieselguhr with metals, rubber, etc.—C. R. C. Gostling. 34962.

Carbocyanine dyestuffs, manufacture.—W. W. Groves. 35115.

Monoazo dyestuffs, manufacture.—W. W. Groves (I. G. Farbenindustrie). 34485.

Quaternary nitrogen compounds, manufacture.—W. W. Groves (I. G. Farbenindustrie). 35116.

Acrylic acid, manufacture.—R. Hill and Imperial Chemical Industries, Ltd. 34913.

Monoazo dyestuffs.—Imperial Chemical Industries, Ltd., and A. H. Knight. 35003.

Chemical washing-out of weak gaseous acids from gases.—G. W. Johnson (I. G. Farbenindustrie). 34988.

Aldehydes, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 35119.

Mixed polymerisation products, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 35120.

Sulphur, production.—L. F. W. Leese. 34635.

Hydrolysis of oils, etc., under pressure.—A. G. Metallges. (Germany, Dec. 20, '34.) 34701.

Carbonaceous matter, distillation.—G. W. L. Morgan. 34578.

Drying oils, etc., treatment.—Naamlooze Vennootschap Industriele Maatschappij voorheen Nowry and van der Lande. 34789.

Forthcoming Events

LONDON

Jan. 13.—Institution of the Rubber Industry. (London Section). "Rubber Derivatives." Dr. Philip Schidrowitz. 7.30 p.m. 12 St. James's Square, London.

Jan. 14.—Pharmaceutical Society of Great Britain. "Sterilisation Technique." Dr. H. Berry. 8.30 p.m. 17 Bloomsbury Square, London.

Jan. 15.—Royal Society of Arts. "Food and the World." Dr. L. H. Lampitt. 8 p.m. John Street, Adelphi, London.

Jan. 15.—Institution of Chemical Engineers. "Flotation as Applied to the Chemical Industry." Dr. William Cullen and H. Lavers. 6.30 p.m. Burlington House, Piccadilly, London.

Jan. 16.—The Chemical Society. Discussion on "Stereochemistry," opened by Dr. W. H. Mills, followed by Dr. P. Maitland on "Allene Dissymmetry"; Dr. S. Sugden on "Stereochemistry of 4-Co-ordinated Compounds of the Transitional Elements"; Dr. Alex. McKenzie on "Stereochemistry of Intramolecular Changes"; Dr. E. E. Turner on "Stereoisomerism Dependent on Restricted Rotation about a Single Bond." 8 p.m. Lecture Theatre of the Royal Institution, 21 Albemarle Street, London.

Jan. 17.—Institute of Fuel. Debate on "Has the Fuel Oil Tax Justified Itself," opened by H. L. Pirie and Isaac Lubbock. 7 p.m. British Industries House, Marble Arch, London.

BIRMINGHAM

Jan. 14.—Institute of Metals (Birmingham Section). "Light Alloys." Harold G. Warrington. 7 p.m. James Watt Memorial Institute, Birmingham.

Jan. 16.—Institute of Vitreous Enamellers (Midland Section). "Costing for Vitreous Enamelling." F. B. Sellars. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

GLASGOW

Jan. 13.—Institute of Metals (Scottish Section). Joint meeting with the Institution of Automobile Engineers, Scottish Centre. "Fatigue in Relation to Automobile Engineering." Capt. L. W. Johnson. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

HULL

Jan. 14.—Hull Chemical and Engineering Society. "A Survey of Modern Fatty Oil Processes." T. Andrews. 7.45 p.m. Municipal Technical College, Park Street, Hull.

LIVERPOOL

Jan. 17.—Society of Chemical Industry (Liverpool Section). Joint meeting with the Plastics Group. "Plasticisers in Plastics." Dr. T. H. Durrans. 6 p.m. University, Liverpool.

MANCHESTER

Jan. 15.—Manchester Metallurgical Society. "Recent Developments in Alloy Steels." H. G. Monypenny. 7 p.m. Engineers' Club, Albert Square, Manchester.

Jan. 16.—Institute of Brewing (North of England Section.) "Modern Refrigeration Practice and its Application in Breweries." W. F. Ball. Midland Hotel, Manchester.

Jan. 17.—Society of Dyers and Colourists (Manchester Section). "Comparison of the Dyeing Properties of Australian Grown Cotton and Native American Cotton." Dr. H. A. Thomas. 7 p.m. 36 George Street, Manchester.

NEWCASTLE-ON-TYNE

Jan. 14.—Institute of Metals (North-East Coast Section). "Hot Pressings in Brass and other Metals." J. Willis Beard. 7.30 p.m. Armstrong College, Newcastle-on-Tyne.

Jan. 14.—Institute of Chemistry (Newcastle-on-Tyne Section.) "The Function of the Specialist in Society." Dr. A. Cobban.

Jan. 17.—Institute of Chemistry (Newcastle-on-Tyne Section). Joint meeting with the Society of Chemical Industry. "The Newcastle Chemical Society." Dr. J. T. Dunn.

NOTTINGHAM

Jan. 16.—Society of Chemical Industry (Nottingham Section). Jubilee Memorial Lecture. "Sterols and Vitamins." Professor I. M. Heilbron. 7.30 p.m. University College, Shakespeare Street, Nottingham.

SHEFFIELD

Jan. 15.—Society of Glass Technology (Yorkshire Section). "The Nature of Glass: A Few Suggestions for Further Research." J. E. Stanworth. 7.30 p.m. University, Sheffield.

Jan. 17.—Institute of Metals (Sheffield Section). "Diffusion of Gases through Metals." Dr. C. J. Smithells. 7.30 p.m. University, Sheffield.

WORKINGTON

Jan. 17.—West Cumberland Society of Chemists and Engineers. "The Use of Coke for Domestic Purposes." Dr. R. A. Mott. 7 p.m. Workington.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—An agent established at Melbourne wishes to obtain the representation, on a purchasing basis, of United Kingdom manufacturers of dextrine, first-pressings castor oil, bichromate of potash, sodium bichromate, calcined glaubers salts, metachrome mordant. (Ref. No. 16.)

New Zealand.—H.M. Trade Commissioner in Wellington reports that the New Zealand Post and Telegraph Department is calling for tenders, to be presented in Wellington by March 16, 1936, for the supply of 12 hydrometers. (Ref. T.Y. 10311.)

South Africa.—H.M. Trade Commissioner at Cape Town reports that the Public Works Department is calling for tenders, to be presented in Cape Town by February 7, 1936, for the supply of oil-fuel steam boilers, feed pumps and automatic equipment. (Ref. T.Y. 5620.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Egyptian Ministry of the Interior is calling for tenders, to be presented in Egypt by March 10, 1936, for the supply of oils, etc., for soap making required by the Prisons Administration for the year commencing May 1, 1936. (Ref. T.Y. 203.)

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'Phone: Regent 1611